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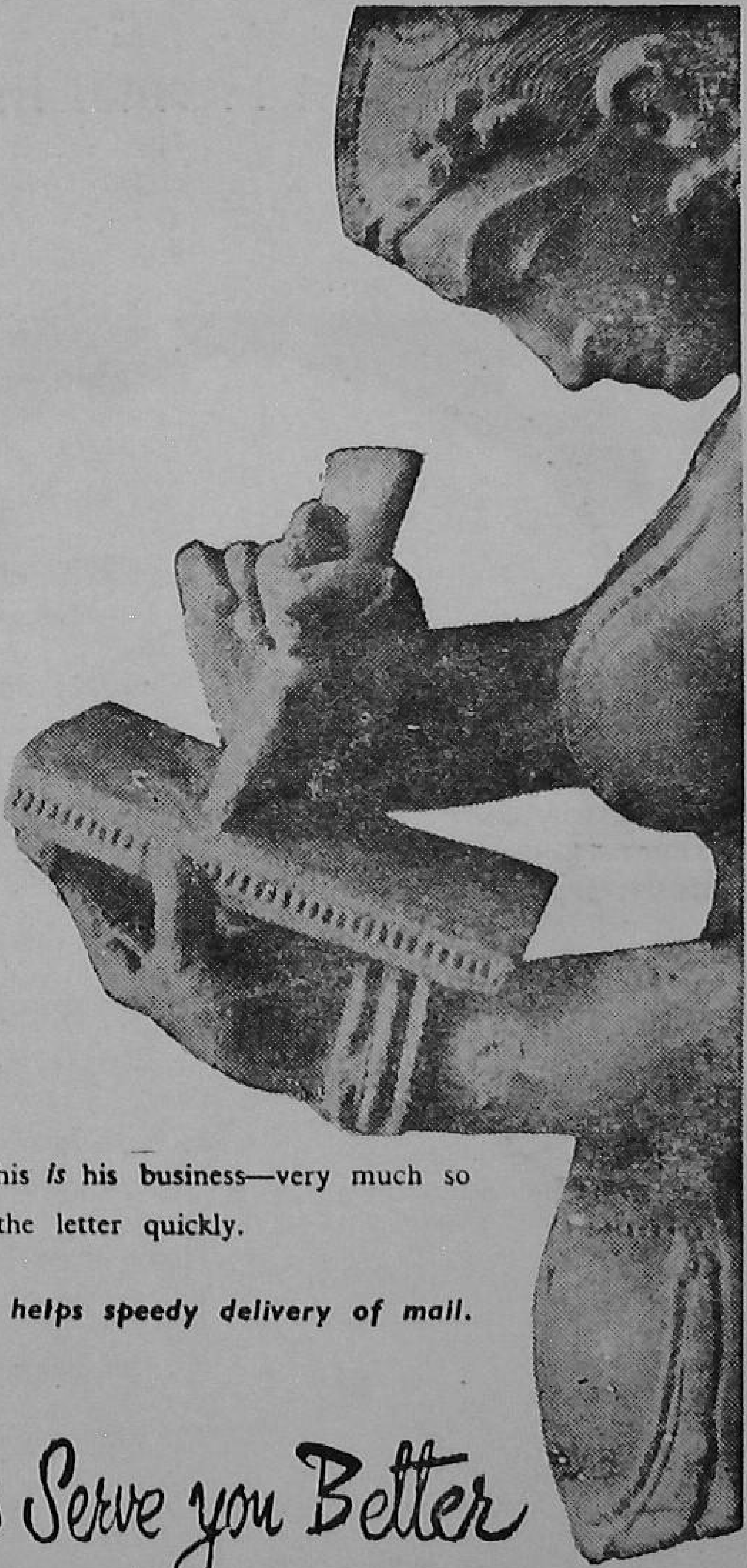

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Some new PUSA WHEATS

By B. P. PAL

THE Indian Agricultural Research Institute is one of the foremost centres of wheat breeding in India. The Institute was established as far back as in 1905 at Pusa in Bihar. That is why it is commonly known as the Pusa Institute, even when it was shifted from Pusa after the great earthquake of Bihar in 1934, to its present location in New Delhi. For the same reason, the wheats bred at this Institute became famous, both in India and abroad, as "Pusa wheats." Since the Institute came to New Delhi, the wheats have been called "N. P." (New Pusa) wheats.

Pusa 4 (now *N. P. 4*) was the first improved wheat variety of India. It was produced by the Institute in the first decade of this

century. This wheat covered extensive tracts, not only in India, but also in some other countries like Australia and southern Rhodesia. It won several prizes for grain quality in international grain exhibitions held in Canada.

Following the release of *N. P. 4*, the Institute produced several other wheat varieties such as *N. P. 12*, *N. P. 52*, *N. P. 80-5*, *N. P. 111*, *N. P. 114*, *N. P. 120*, *N. P. 125* and *N. P. 165*, each of which became very successful in one region or another. Thus, *N. P. 52* at one time became the most dominant wheat in Bihar and it also achieved considerable success in Bengal, eastern Uttar Pradesh and Madhya Pradesh. *N. P. 80-5* became popular in the hills of Uttar Pradesh and the Punjab, *N. P. 125* in the plains of Uttar Pradesh, and *N. P. 165* in Delhi and the adjoining areas and also in the Saurashtra area of Gujarat.

Several diseases attack the wheat crop in India. The rusts, of which there are three kinds—black, brown and yellow—and the looses mut are the principal ones among them. It is estimated that wheat crop worth about five crores of rupees is annually lost in India due to the rusts alone. In epidemic years, which are not infrequent, the losses are far heavier.

There is no effective and cheap way of controlling the rusts except for the use of disease-resistant varieties. The loose smut can be controlled to some degree by subjecting the grain to hot water treatment. But this treatment is bothersome and it cannot be said to be wholly effective when done on a large scale; here also, therefore, the use of loose smut-resistant varieties gives the most effective control of this disease and, from the farmers standpoint, it is quite an inexpensive way of combating the disease.

Therefore, the work of breeding disease-resistant wheat varieties was taken up at this Institute, for the first time in India, in 1935. As a result of this work, a number of wheat varieties, which are fully resistant to loose smut and are either tolerant or resistant to the rusts, have been produced. This work has been in progress at the Headquarters of the Institute at New Delhi and at five of its substations, located at Simla and Bhowali in the northern hills, at Pusa in Bihar, at Indore in Madhya Pradesh and at Wellington in the Nilgiri hills in Madras State.

In India, three major types of wheat are under cultivation: (1) the common bread wheat (*Triticum aestivum*, previously known as *T. vulgare*) which accounts for about 90 per cent of the wheat area in India; (2) the hard or macaroni wheat (*T. durum*) which is mostly grown in Central and Peninsular India, and (3) the *samba* or *khapli* wheat (*T. dicoccum*) which occupies only a few thousand acres in the Nilgiri and Palani hills and in small pockets elsewhere. The sub station at Indore is devoted primarily to the breeding of rust-resistant varieties of *durum* wheat and that at Wellington, of *samba* or *dicoccum* wheat.

PRINCIPAL N. P. WHEATS

The principal among these *N. P.* varieties, which have already covered extensive areas in the country, and some newer *N. P.* wheat varieties are described below:

N. P. 710 : Loose smut-resistant and rust tolerant ; medium in maturity ; ears bearded. Suitable for western and central districts of U. P., West Bengal, Koraput and other hilly areas of Orissa, south Bihar, northern Madhya Pradesh, the Marathwada area of Maharashtra, Gujarat and Andhra Pradesh.

N. P. 718 : Loose smut-resistant and rust-tolerant; early maturing ; ears bearded. Suitable for Delhi, south-eastern Punjab, south-eastern Rajasthan, Gujarat, the Marathwada area of Maharashtra, the Nimar area of Madhya Pradesh, western U. P. and plains of Orissa.

N. P. 720 : Although susceptible to loose smut and rust, it is recommended by the U. P. Department of Agriculture, owing to its high-yielding ability for the medium-fertile soils of the Tarai region.

N. P. 761 : Loose smut and yellow rust-resistant ; early maturing : ears bearded. Suitable for Bihar, in the non-irrigated tracts of Saran; Muzaffarpur and Darbhanga Districts for normal sowing and in *tal* and *chaur* lands for late sowing.

N. P. 798 : Loose smut and black rust-resistant ; early maturing ; ears-tip awned. It has become very popular in Bihar and West Bengal, especially after the rust epidemic of 1956-57. Also suitable for eastern U. P., plains of Orissa and the Saurashtra area of Gujarat.

N. P. 770 : Loose smut and yellow rust resistant ; medium-late in maturity ; ears bearded and attractive. Suitable for higher elevations (7,000 ft. and above) in the hilly regions of Himachal Pradesh, U. P. and West Bengal.

N. P. 809 : Resistant to loose smut and to a large number of physiologic races of all the three rusts ; late maturing ; ears-tip awned. Suitable for medium to high elevations (between 5,000 and 7,000 ft.) in the hilly regions of Himachal Pradesh, Jammu and Kashmir, U. P. and West Bengal.

Ridley : Introduced by this Institute from Australia. It has good standing ability, attractive and compact, beardless ears and bold grains. Partially rust-resistant and susceptible to loose smut ; yet it has become very popular in the lower hills of Himachal Pradesh, Punjab, U. P. and West Bengal.

N. P. 792 : A very early maturing variety, resistant to loose smut and black rust. It has been found suitable in the Paonta Valley of Himachal Pradesh and is also recommended for sowing after late paddy harvests in the northern hilly region.

NEWER N. P. WHEATS

a) Bread wheat varieties :

N. P. 823 : Loose smut and black rust resistant and partially resistant to yellow rust ; early maturing ; ears bearded, somewheat prone to shattering if the crop is left long in the field at maturity ; grains bold and attractive. Suitable for soils of average and high fertility, and also for early and late sowing in Delhi State and adjoining areas.

N. P. 824 : Loose smut and black rust resistant and partially resistant to yellow rust ; medium maturity ; good tillering and standing ability ; ears bearded, long and attractive. In tests on grain quality recently conducted in Canada, it was adjudged as being the best among the Indian wheats. Suitable for rich soils with good irrigation facilities. It has shown very wide adaptability and has done very well in Delhi, U. P., Bihar, West Bengal, Orissa, Gujarat, Maharashtra and Mysore.

N. P. 825 : Loose smut and black rust resistant and partially resistant to yellow rust ; medium maturity ; ears bearded. Has done very well in western U. P., Punjab and Rajasthan. In Rajasthan, it has been recommended by the Department of Agriculture for cultivation in the Sriganganagar area.

N. P. 829 : Fairly resistant to all the three rusts and to loose smut. Suitable for cultivation in the lower hills of U. P., Himachal Pradesh and Jammu and Kashmir, in preference to *Ridley* in areas where varieties earlier in maturity than *Ridley* are needed.

N. P. 832 : A black rust-resistant variety, possessing *Pissi*-type soft grains. Very suitable for cultivation in the Malwa region and adjoining tracts in Central India where *Pissi* wheats are commonly grown.

N. P. 830: Resistant to yellow rust ; susceptible to loose smut and the other two rusts ; medium-early in maturity ; ears bearded; grains bold and attractive; the crop stands up very well under high soil fertility conditions because of its medium-tall plant height. Has done very well both in normal and late sowings. This variety has given in recent trials a very good performance in Delhi, western U.P., and parts of Rajasthan and the Punjab.

N. P. 835: Resistant to yellow and brown rusts and partially resistant to black rust; susceptible to loose smut; early maturing; ears bearded. In recent trials, it has given promising results in eastern U. P., Bihar, West Bengal and Orissa.

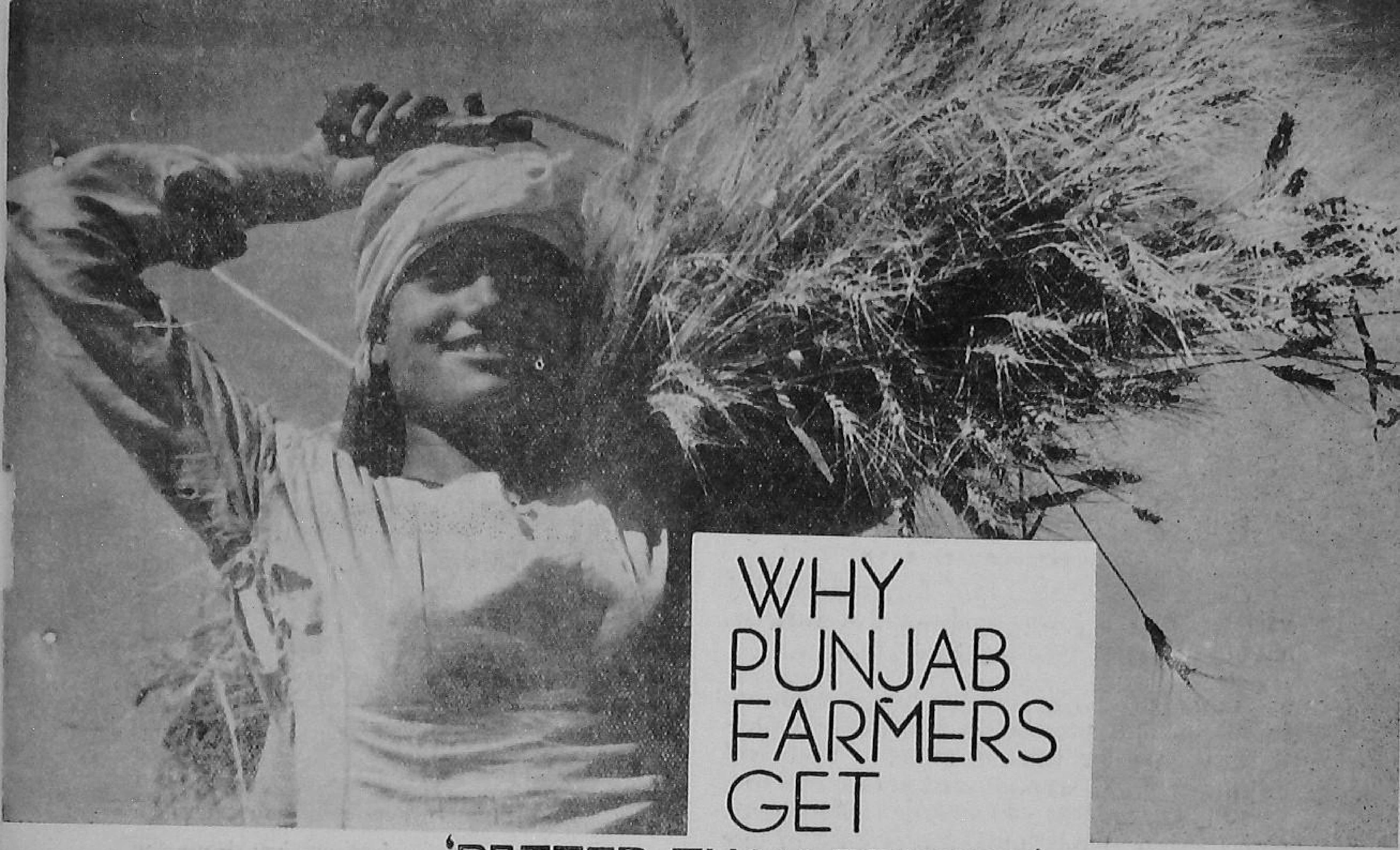
N. P. 836: This is a bearded wheat produced by irradiation of a beardless rust-resistant variety—N.P. 799—a sister selection of N. P. 798. In the recent preliminary trials at Pusa in Bihar, it out-yielded N. P. 798.

b) Rust-resistant *Khapli* or *samba* wheats (*T. dicoccum*)

For cultivation in the Nilgiri and Palani hill area of Madras State, and in adjoining tract where *samba* or *khapli* wheats are grown, the black and brown rust resistant variety, *N. P. 200*, has been found to be very suitable and is recommended. This variety has bolder grain, higher protein content and higher grain to-husk ratio as compared to the local *samba* wheats.

c) Rust-resistant *durum* wheats:

The indigenous *durum* wheats of India are all-rust susceptible and no resistant variety was so for available. Recently, a number of black and brown rust-resistant *durum* varieties, possessing bold and very attractive grains, have been developed by this Institute. In the preliminary trials conducted in Central India, some of these, especially *N. P. 403*, *N. P. 406*, *N. P. 407* and *N. P. 401*, have given excellent performances and appear be very promising.



WHY PUNJAB FARMERS GET 'BETTER THAN BEFORE' WHEAT YIELDS

By PRITAM SINGH DIOL AND GURCHARN SINGH

GOOD cultural practices, better crop rotations, adequate manuring, timely measures against pests and diseases and improved varieties—these, in short are the key points of successful wheat cultivation in the Punjab—where production has gone up by nearly 250 per cent since 1947, with the result that the Punjab is once again the 'Granary of India.'

The hints on better wheat cultivation suggested to the Punjab farmers by the Department of Agriculture, Punjab, will be of interest to farmers elsewhere also

SELECT THE SUITABLE SOIL

Wheat grows on all kinds of soils excepting alkaline and water-logged ones.

Medium loam soils, however, are the best for wheat.

PREPARE THE LAND WELL

The better you prepare the land the better will be the wheat crop.

Plough the land with a *desi* plough eight to ten times in rainfed areas. In irrigated lands give the first ploughing with a furrow-turning plough and follow it up with four to five ploughings with a *desi* plough. Run a *sohaga* (the wooden leveller) after each ploughing. This will give a fine tilth and conserve moisture in the soil.

USE A PROPER SEED-RATE

Use a higher seed-rate for bold-seeded varieties and a lower seed-rate for varieties having a higher tillering capacity.

You will have to use the higher seed-rate in case of late sowing, in lands of a higher fertility and in rainfed areas. You will require 28 to 32 seers of seed per acre in irrigated lands and 36 to 40 seers in rich irrigated soils, *barani* lands and also in case of late sowings.

SOW AT THE RIGHT TIME

The best period is from the middle of October to the middle of November. In the south eastern districts of the Punjab sow in the latter half of October and in the central zone in the first half of November. You can sow even up to the end of November in the sub-montane and hilly areas.

If you are going in for late sowing, you can do it up to the middle or the third week of December with good results. You can, do the sowing even up to the end of December though.

In Lahaul valley, wheat is grown as a summer crop in April and May when the snow melts away.

HOW TO SOW

If yours is a big holding and you have prepared the seed-bed well, use a *rabi*-drill for the purpose.

But in case yours is a small holding, sow by *kera* method (dropping seed by hand after ploughing) in irrigated lands and by *pora* method in rainfed areas.

Do not run the *sohaga* after sowing by the *pora* method as it badly affects germination; but you have to run the *sohaga* in the *kera* method to cover the seeds with the soil. Follow it up with harrowing, using a bar harrow to produce necessary mulch which will conserve soil moisture, ensure a good germination and delay *kore* (first) irrigation.

CROP ROTATION TO FOLLOW

In normal cases, two weedings, one before and one after the *kore* irrigation will be sufficient. If there is labour available, you can give one interculturing in place of weeding after the *kore* irrigation.

You will also find a bar harrow useful for keeping down weeds. Use it after a shower of rain in rainfed areas, and after *kore* irrigation in irrigated areas.

WHEN TO HARVEST AND HOW TO THRESH

Wheat is ready for harvest by about the end of March in the south-eastern zone where the season ends up early and hot dry winds start blowing by the time.

In the central and sub-montane regions, the crop is ready in the second week of April; in Kangra Valley in May and in the Kulu sub-division in June and in Lahaul Valley (over 10,000 feet high) at the end of October. The crop is generally harvested by hand and threshed by either treading or by dragging the *phallas* behind the bullocks.

Winnowing is mostly done by hand to separate the grain from the *bhusa*.

DO NOT FORGET INTERCULTURING

It is only in the rainfed areas that wheat is grown after keeping the land fallow during the *kharif*. Elsewhere wheat always follows a *kharif* crop.

In the central districts, wheat follows cotton, rice or maize; in sub-montane and hilly tracts, it comes after rice, maize or a pulse crop; whereas in south-eastern districts,

it is grown after *bajra* and in *barani* lands after *chari* also.

As all the *kharif* crops, excepting the pulses, exhaust the land it is a good practice to manure the wheat fields well to get good yields.

USE MANURES AND FERTILIZERS

Experiments show that a dose of 50 pounds of nitrogen to an acre in the form of ammonium sulphate increases the wheat yield by as much as 50 to 60 per cent even in the poor soils of Gurgaon District. You can also use, in addition to this fertilizer, farmyard manure and green manure. You should grow a green manure crop during the *kharif*.

CONTROL WHEAT DISEASES

1. *Loose smut :* Commonly known as '*kanghiari*', loose smut turns the wheat grains into black powder.

In the plains, the solar heat treatment of wheat seed controls the smut completely. In the hills, however, where the heat of the sun is not so intense, give your wheat seeds the hot water treatment.

2. *Flag smut :* It is very difficult to control flag smut completely; for the disease is both soil-and seed-borne. It is particularly serious in the sub-montane regions.

You first notice the disease when long narrow lead-grey streaks appear on the leaves. The affected plants seldom produce any seed.

Control the disease with copper sulphate solution at 2 *chhataks* for every maund of seed. 'Ceresan' or 'Agrosan GN' used in the ratio of 1 for 400 parts of seed is equally good; but copper sulphate is much less poisonous.

3. *Hill bunt or stinking smut :* It is mainly confined to the Kangra District.

To control the disease, treat the seed with 'Ceresan' or 'Agrosan GN' Use one pound of the chemical for five maunds of seed.

If however, you, sow the crop early, it will be free from the disease to a great extent. If you raise the crop from the seed obtained from the plains, the crop will not be attacked by bunt in the first year.

4. *Earcockle :* Locally known as *mamni*, the disease is found all over the State but is particularly serious in the Districts of Kangra, Rohtak, Karnal and Hissar.

Remove the infected grains (the earcockle galls) by dipping in a bucket of water. This you can easily combine with the anti-smut solar heat treatment when the seed is first soaked in water for about four hours. Destroy the galls preferably by burning.

5. *Foot-rot :* The disease is common in *barani* areas, especially where the crop is sown early and the temperature is comparatively higher; the disease attacks and kills the seedlings in early stages. The cause of the death of seedlings is often mistaken for the attack by white ants.

Sow the seed when the weather has cooled down sufficiently. Under *barani* conditions, this is possible if the soil moisture has been sufficiently conserved by dry farming practices. Where irrigation water is available, a good *rauni* (irrigation before sowing) irrigation of about four inches will keep the disease fairly under control.

6. *Rusts :* All the three rusts—black, brown and yellow—attack the crop. The only way to control them is to use rust-resistant varieties.

CONTROL PESTS ALSO

1. *White ants :* Give a light irrigation which will help control this pest. You can also use Gammexane at 15 seers per acre at the time of sowing. This will control the pest effectively.
2. *Cutworms :* Early sown crops are sometimes attacked by cutworms, a very destructive pest. Sow the crop when the season is milder. You can also use BHC. dust to control the pest.

Storage pests : *Khapra* and *susri* are the two important storage pests. To control these pests.

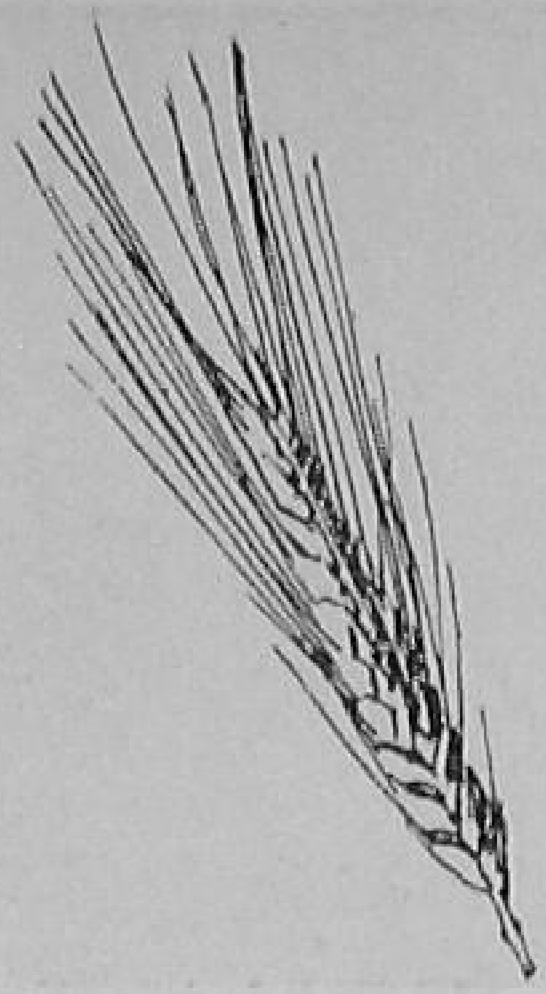
1. Store wheat in clean and disinfected godowns.
2. See that you do not use old infected gunny bags.
3. Fumigate your godown with E.D.C.T. mixture (20 pounds of E.D.C.T. mixture for 1,000 cubic feet) and HCN (1 pound sodium cyanide and 1½ pounds of sulphuric acid per 1,000 cubic feet): Dust five per cent BHC on the walls, on the floor and ceilings of godowns.
4. You can also treat the wheat seed with Gammexane at one *chhatak* per maund. This way you can prevent the attack from all insects. *But remember that Gammexane-treated seed is not fit for consumption.*

Follow these cultural practices and......

USE IMPROVED VARIETIES

Improved varieties alone can increase the yields by as much as 15 to 20 per cent. See which one of these is best suited to your area.

1. *Varieties*	C.253	C.281	C.273	C.285	C.286
2. *Region for which recommended*	Hilly areas, especially of Kangra and Kulu Valleys.	South-eastern dry Hariana tracts.	Central and sub-montane tracts of the State.	Lahaul and Spiti District at 10,000 to 11,000 feet altitudes.	Sub-montane tract and lower altitudes of Kangra District. For late sowing in the central districts also.
3. *Condition of sowing under which recommended*	All types of sowings in hilly tracts of the State.	All types of sowings in the south-eastern districts.	Timely sowing; high and average fertility; irrigated areas in central zone and high fertility, irrigated areas in sub-montane tracts.	Under irrigated and rainfed conditions.	For all conditions of sowing except in rich lands in the sub-montane tracts and for late-irrigated areas in the central districts.
4. *Average yield per acre in maunds*	15 to 30	15 to 40	22 to 45	14 to 20	18 to 23
5. *Remarks*	Resistant to yellow rust and loose smut.	Renowned for attractiveness of the grains.	Reputed for high yield and shapely grains; has got wide adaptability.	Being resistant to diseases, has become popular.	Highly resistant to all the rusts and loose smut.



By H. G. SINGH

FOR A BETTER WHEAT YIELD IN BIHAR

IN BIHAR, farmers grow wheat on 14,59,000 acres and collect 3,98,000 tons of grain a year. Research over a number of years in the State has shown better ways of growing wheat, which the Extension people are trying to pass on to the farmers.

Below are the main recommendations :

PREPARE THE LAND WELL

Wheat needs a well-prepared bed for sowing. Therefore, pulverize the soil well, but not to the extent of making it too fine like dust. Apply compost next.

The way, you are going to prepare the land, however, will depend on the soil condition, the crop rotations followed and on whether you are raising the crop irrigated or rainfed.

If you have kept your land fallow during the monsoon, and particularly if your soil is alluvial, plough and cross-plough eight to ten times, but not more than that. Give one or two ploughings during the monsoon and the rest after the monsoon. Follow the ploughings by working a beam, also known as *henga*.

In case you are green manuring the land, do it in the first half of August. You can start your ploughings after a month of burying the green manure.

USE IMPROVED SEED

Select a variety best suited to your area. *N.P. 798* and *N.P. 799* are good for all areas in Bihar.

For late sowing in *tal*, *chaur* and *diara* lands, use the early variety, *N.P. 761*.

Some of new improved wheat varieties

For Patna, Gaya, Shahabad, south Monghyr and south Bhagalpur area, *N.P. 710*, a mid-seasonal variety, is also suitable.

For Tirhut region, *N.P. 761* is suitable for normal sowing.

Use 20 to 30 seers of seed to an acre, if the seed is healthy and can germinate well.

WHEN TO SOW AND HOW

Sow the seed from the first to the third week of November. Experiments show that the middle of November is the best time for sowing.

Experiments also show that if you at all have to delay your sowings, you can do it till the first week of December and even get yields up to 15 maunds per acre provided there is enough moisture at the time of sowing and also if you use varieties like *N.P. 798* or *N.P. 799*. Do not sow before the first week of November, however, if you are in the north or south Bihar, for most of the plants die off due to the heat at that time.

In Chhotanagpur, where the temperature comes down earlier and the moisture is lost quicker, you can sow from mid-October to early November to make use of the available soil moisture.

WHAT MANURES TO USE

Apply 150 to 200 maunds of compost or farmyard manure. If you cannot get them, you can grow a green manurer crop like *akawan* on field bunds or in othe places you can spare.

You can also grow *moong* or *kalai* mixed with maize. This way you can get a green manure for wheat without losing a crop during the *kharif* season.

It is a good practice to apply 1½ to 2 maunds of single superphosphate per acre while sowing green manure seed.

Sow wheat only after the green manure plants are completely decomposed.

WHICH FERTILIZERS TO APPLY

If you are not using any organic manure you should apply 200 pounds of ammonium sulphate and 260 pounds of single superphosphate per acre. This a is general dose, and for exact amounts of fertilizers to be applied in your area, see the, box.

In heavy soils, place the fertilizers, both nitrogenous and phosphatic below the seed. In case the soil is light, broadcast the nitrogenous fertilizer. Better apply the nitrogenous fertilizer in two doses, the first one at the time of sowing and the second a month after, when irrigating the field.

WHEN TO IRRIGATE

If you find that there is not enough moisture in the field you should give an irrigation even before sowing. This will help the seed germinate well.

After the first pre-sowing irrigation, give another two or three, three acre-inch irrigation. Give them at the time of tillering (three to four weeks after sowing), just before flowering and at the milk stage. This will help you get good crop.

WHAT ROTATION TO FOLLOW

Follow any one of the crop rotations, depending of course on the conditions in your area.

- Paddy (early)—wheat (irrigated areas)
- Green Manuring—wheat (irrigated areas)
- Paddy—wheat (irrigated), green manuring—sugarcane.
- *Urid Moong*, Cowpea, Maize (alone or mixed)—Wheat.
- Maize—wheat—Green manure—Sugarcane
- Maize-potato, Sugarcane-Green manure crop—wheat alone or mixed with gram.
- Fallow—wheat (in *Tal*, *Chaur* and *Diara* areas, without irrigation)
- Early paddy or *marua* or maize-wheat alone or mixed with gram.

MIXED CROPPING

In areas where water for irrigation is not available, wheat is usually sown mixed with some other crops like gram, peas, and mustard. Experiments show that wheat and gram mixed in the ratio of 2:1 give good results.

INTERCULTURE

Use a zig-zag cultivator or a peg-tooth harrow before sowing. This simple implement is very good for collecting the uprooted weeds.

Use a light hand-hoe for intercultivating the crop, It is handy, cheap and very useful.

You can also control broad-leaved weeds by spraying the crop with 'Fernoxone' one pound dissolved in hundred gallons of water. It is economical too.

You should also run the light peg-tooth harrow or bar harrow over the field. This will loosen the soil, create a fine mulch and help get a better tillering. In Uttar Pradesh, it resulted in as much as ten per cent increase in the yield.

Wheat variety *N.P. 799* grown in a three-year rotation, yields 20 maunds an acre

Wheat variety *B.R.319*, grown in a three-year rotaion, yields 16 maunds an acre

ROGUE OUT OFF-TYPES

Remove all off-type plants so that you get pure seed. Also collect smut-infected plants and burn them.

Loose smut, karnal bunt, flag smut, foot rot and rusts (yellow, brown and black) are some of the major diseases which attack the crop.

One way to prevent the attack of loose smut is to use disease-resistant varieties,

Wheat variety *N.P. 798* grown by the transplantation method at Bikramganj Farm, Shahabad

namely *N.P. 710*, *N.P. 798*, *N.P. 799* and *N.P. 761*.

To prevent foot rot, treat your seed in a seed-dressing drum with 'Agrosan GN' at 1¼ *chattaks* per maund of seed just before sowing.

Termites are a great enemy of the crop. They attack the roots of plants and kill them. To control termites :

1. Apply 5 per cent BHC at 20 to 25 pounds per acre in termite-infected soils at the time of sowing. This will cost you only three rupees an acre.
2. In case irrigation water is available in your area, irrigate (in a mild attack) or flood (in a severe attack) the infested field. Apply crude oil emulsion at 1 to 1½ gallons per acre along with irrigation water.

Cutworms are the most dangerous enemy of wheat. The caterpillars start damaging the crop as soon as they come out of the eggs. They hide under the soil during the day, and come out in the evening to cut the plants and feed on them. You can find the eggs on the plant leaves.

To control cutworms :

1. Treat the field with 5 per cent 'Aldrin' at 25 pounds per acre, while preparing the land for sowing, in areas where they attack every year.
2. In the early stages of attack, you can also dust the plants with 5 per cent DDT at 20 to 25 pounds per acre.
3. In case the attack is very heavy, dust the plants with 5 per cent 'Aldrin' at 30 pounds per acre.

WITH WHAT TO HARVEST AND THRESH

A sickle is all you need for harvesting if you have a small field. A bullock-drawn or tractor-drawn reaper will be useful in large-scale farming. A disc harrow worked with a light tractor will cost you only Rs. 35 to 40 for a ten-hour operation. Within this time it separates nearly 50 to 80 maunds of grain without any breakage or loss in the quality of the grain.

Spraying wheat variety *B.R. 319* against pests

For threshing, use the Olpad Thresher, (costs about Rs. 150) which does the job in less than half the time required by bullocks.

STORAGE

Clean the grain and dry it completely before storing. Also get the godowns cleaned, fumigated and dried before the seed is stored there.

Of course, pucca godowns and metal bins the are best for storage, but you can also use earthen bins for the purpose. See that all cracks, crevices and holes in the store room or in the earthen bins are closed.

Disinfect the godowns, bins and bags by spraying with 0.25 per cent DDT.

Mix the grain with 'Pyrodust' (a powdered wheat base containing 1.1 per cent Pyroxyl butoxide and 0.8 per cent Pyrethrin) at hundred pounds for every thousand maunds of grain.

These are the pests which attack the grain during storage. Some of these are:

Rice weevil
Lesser grain borer
Common flour bettle
Saw-toothed beetle
Khapra

Immediately you notice any of these pests in your grain, take the following measures:

1. Dust the grain bags with 5 per cent BHC.
2. Fumigate the grain with Ethylene dichloride carbon tera-chloride (EDCT) at 30 pounds per thousand maunds of grain.

Have this done only by an expert as it is a very dangerous operation.

HOW MUCH FERTILIZER TO USE IN BIHAR

	WHERE	HOW MUCH	
1.	Hajipur, chapra Sadar, Begusarai, Kishenganj, Aurangabad,Buxar, Dumka Jamui	S/A 3 mds.	+ S.S.P. 3 mds. + M/P. ½ md.
2.	Muzaffarpur Sadar, Siva Purnea Sadar, Katihar, Khagaria, Arrah Sadar, Moghyr Sadar	S/A 3 mds.	+ S.S.P. 1½ mds. + M/P. ½ md.
3.	Gopalganj, Motihari, Bettiah, Supaul, Patna Sadar, Barh, Biharsharif, Banka,Godda and Sahebaganj	S/A 1½ mds.	+ S.S.P. 3 mds. + M/P ½ md.
4.	Darbhanga Sadar, Dinapur. Jahanabad, Bhagalpur Sadar, Pakur, Jamtara, Ranchi Sadar, Latehar,Baghwara, Daltonganj, Garhwa, Dhanbad, Hazaribagh Sadar, Saraikela Tatanagar	S/A 1½ mds.	+ S.S.P. 1½ mds. M.P ½ md.
5.	Gaya Sadar and Sherghati, Simdega, Khunti, Gumla, Sasaram, Madhubani	S/A 1½ mds.	+ S.S.P. 1½ mds.
6.	Saharsa, Deoghar, Chetra	S/A 3 mds,	+ S.S.P. 3 mds.
7.	Sitamarhi.	S/A 3 mds.	+ S.S.P. 1½ mds.
8.	Samastipur and Bhabhua.	S/A 3 mds.	+ S.S.P. 1½ mds. + M/P 3 mds.
9.	Chaibasa	S/A 1½ mds.	+ S.S.P. 3 mds. + M/P 1 md.
10.	Nawadah	S/A 1½ mds.	+ S.S.P. 1½ mds. + M/P 1 md.
11.	Giridih	S/A 1½ mds,	+ S.S.P. 3 mds

S/A = Sulphate of Ammonia
S.S.P. = Single Superphosphate
M/P = Muriate of Potash

IN UTTAR PRADESH, IT IS THE 'U.P. METHOD' YOU SHOULD TAKE UP

UTTAR PRADESH FARMERS HAVE HARVESTED THIS YEAR 90 LAKH TONS OF WHEAT. TEN YEARS AGO, IT USED TO BE 25 LAKH TONS. EVEN SO, EXPERTS FEEL THE AVERAGE YIELD OF 11 MAUNDS AN ACRE IS TOO LOW. THEY BELIEVE FARMERS CAN TAKE IT UP TO EVEN 50 MAUNDS, IF THEY TAKE TO THE 'U.P. METHOD.' HERE IS WHAT THE METHOD IS.

By Y. R. MEHTA

SELECTING THE SOIL

YOU can grow wheat in all types of soil excepting on sandy soils of the alluvial plains of the State and *raker* soils in Bundelkhand. Of course, your best selection would be a well-drained loam.

PREPARING THE SEED-BED

If you are green manuring the field, give the first ploughing with a heavy soil-turning plough like Victory, Punjab or Gurjar plough. Follow it up with three or four workings with a cultivator. Turn in the green manure by the middle of August.

If you are not green manuring your field, give the first ploughing with a light soil-turning plough. Follow it up with four to five workings with a cultivator. This will help produce a fine seed-bed.

In case you are using a country plough, give 10 to 12 ploughings and cross-ploughings in non-green-manured fields and 6 to 9 ploughings in green-manured fields.

In either case, use a *patela* after every cultivation.

You should plough the land either in the early morning or in the evening. Also see to it that you preserve the moisture well.

MANURING THE FIELD

Wheat, to yield well, must be given 50 pounds of nitrogen, and 40 pounds of phosphoric acid together with organic manures.

Experiments show that to get quick results there is nothing like giving a nitrogenous fertilizer combined with a phosphatic fertilizer. The crop responds as much as four times to such a mixture, which has both nitrogenous and phosphatic fertilizers, than to nitrogenous fertilizer alone. For exact requirements, follow the following schedule.

BASAL MANURING

For the wheat taken after fallow or as a kharif crop. In case you are not green manuring the field, manure with a hundred maunds of well-rotted farmyard manure at least a month before sowing.

During the final ploughing, give 18 to 20 pounds of nitrogen and 9 to 10 pounds of phosphoric acid. In case phosphates are lacking in your soil, you can double the dose of phosphoric acid.

You can apply the nitrogen in the form of calcium ammonium nitrate or urea or ammonium sulphate or ammonium sulphate nitrate, and phosphates as superphosphate or a mixture of superphosphate and bonemeal, in equal parts by weight.

If you are unable to give sufficient farmyard manure, increase the dose of fertilizers accordingly. A hundred maunds of farmyard manure supplies about 20 pounds of nitrogen and 10 pounds of phosphoric acid.

Wheat grown after green manuring: Sow a green manure crop by the end of June or the first week of July. Turn it in by the middle of August.

In well-drained sandy loams and loam soils, choose *sanai* and sow it at 40 seers per acre. In water-logged fields, grow *dhaincha.* Use 40 seers of *dhaincha* to sow an acre and turn it in after seven weeks.

Where irrigation water is available, sow *Moong T. 1* or *Urd 9* and *Lobia T. 2* with a *palewa* at eight seers per acre.

In lands which are less fertile or where the green manure crop does not come up well, give a fertilizer mixture containing 12 pounds of nitrogen and 6 pounds of phosphoric acid as a basal dose.

In case the fertilizer mixture of nitrogen and phosphoric acid is not available, broadcast the nitrogenous fertilizer at the time of last ploughing and 100 to 150 pounds of superphosphate just before sowing the wheat. Apply this in furrows, behind the plough at a depth of about three inches through a *nai* in the same row or in a separate row two inches away from the seed-row.

TOP DRESSING WITH FERTILIZERS

Normally, in a fertile soil, no more manuring need be done. But if it rains too much and particularly in light soils where the crop appears to be quite pale and yellow or is stunted in growth, give 50 to 60 pounds of

calcium ammonium nitrate or ammonium sulphate or an equal quantity of urea or ammonium nitrate at the time of second irrigation in December.

SOWING THE SEED

To get high yield of better quality wheat, use an improved variety. It is better to dust the soil before sowing with 20 to 25 pounds of 5 per cent BHC. For, then your crop will be free from white ant attack.

Start sowing by the last week of October and complete it by the first week of November. This is very important; for a late-sown wheat does not give as good a yield as a timely-sown one.

Sow 80 pounds of seed per acre; but in case yours is a fertile land and there is good moisture in the soil, you can sow 60 pounds only.

Sow the seed in straight rows, 9 inches apart, behind the plough. See to it that the seed is sown at a uniform distance in the rows.

It is good to have a wheat nursery corner for gap filling. For, if the weather is not favourable or there is an attack of white ants, etc., the germination of the crop will be affected and there will be gaps in the crop. Fill up these gaps as soon as you notice them, from the wheat nursery. Do this before the first week of December.

IRRIGATING THE FIELD

Give the first irrigation of two inches, three to four weeks after sowing, when the plants are about six inches high. In case the rains fail during December, give the second irrigation in the first fortnight of January.

Give the third irrigation of about three inches, in the first or second week of February when the crop is in the milk stage. Give the irrigation when there is no strong wind, preferably in the evening so that the crop may not lodge.

INTERCULTURING THE CROP

See that the crop is free of weeds, and is properly hoed after the first irrigation, when it is approaching the tillering stage.

Complete the hoeing and harrowing by the seventh week; for this is the period when the crop can utilize the manures and moisture most.

Broadcast 20 to 25 pounds of 10 per cent BHC to save the crop from *gujhia* pest.

Rogue out regularly the smutted or diseased plants.

HARVESTING THE CROP

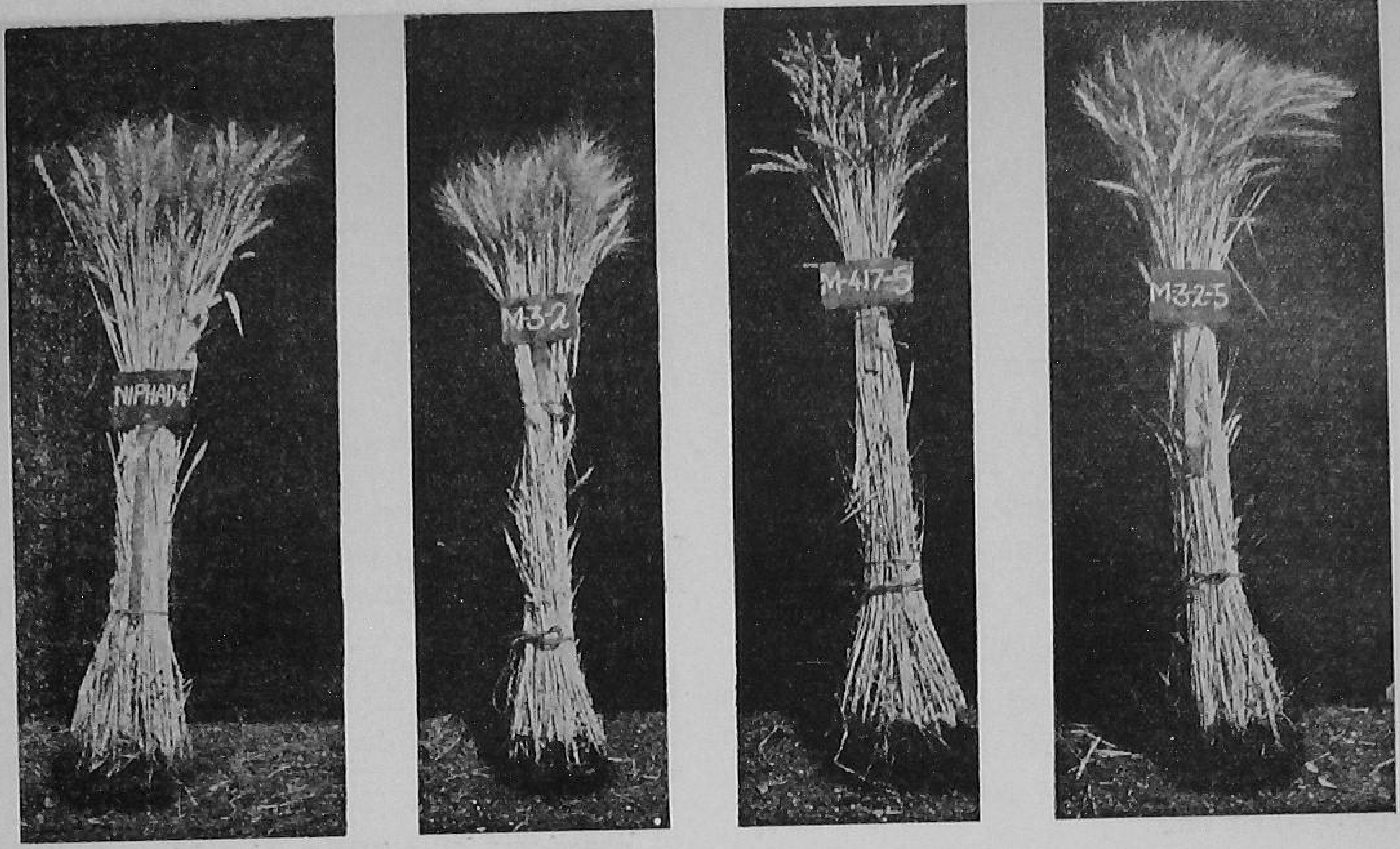
Harvest the crop when the wheat stalks are quite dry and easily break when bent. Use an Olpad thresher to thresh the harvested crop.

STORING THE PRODUCE

Dry the harvested crop completely in the sun and pack in clean and disinfected bags.

Store these bags on a thick layer of dry *bhoosa* so that moisture does not reach these bags and help in the growth of storage pests.

With these tips, popularly known as 'U.P. Method of Wheat Cultivation,' many farmers in Uttar Pradesh are getting as much as 4,000 pounds of grain an acre. You too can get this good yield if you care to put these useful tips into practice.



HOW MAHARASHTRA FARMERS CAN GET BIGGER WHEAT YIELDS

By M. B. GHATGE

Some improved wheats of Maharashtra

DO YOU KNOW ?

* That Maharashtra stands fifth in wheat acreage as well as in yield in the country, area under wheat being 2.3 million acres and the yield—3.67 lakh tons a year.

* That the production has gone up by 54 thousand tons at the end of the Second Plan Period over that of the First Plan.

* That within the State, Nagpur Division stands first in yield and in acreage; Aurangabad Division the is second.

* That during the Third Plan, another research station will be established at Washim in Akola District to carry out breeding work on wheat.

FORTY FOUR years ago, research on the improvement of the wheat crop in Maharashtra was started. Since then, constant efforts are being made to:

* produce varieties which yield better and give good results with fertilizers;
* evolve varieties resistant to diseases like rust, loose smut and foot rot;
* find out better cultural and manurial practices.

Only a tenth of the 2.3 million acres under wheat in the State, is irrigated. The remaining area depends on the rains. The rainfed crop is mostly grown on black cotton soil, having a good moisture-holding capacity (receiving 20 to 40 inches of rainfall). For an irrigated crop, a well-drained black loam or alluvial soil is preferred.

Farmers in the State can reap a better wheat crop, irrigated or unirrigated, if they take up the improvements based on research, as suggested by the State Department of Agriculture. The recommendations are given below.

GROW A BETTER VARIETY

A large number of high-yielding, disease-resistant varieties of improved wheats are available to farmers. Choose the one suited to your farm conditions.

PREPARE THE LAND WELL

Wheat is a winter crop. A good harvest will depend upon the amount of moisture conserved in the soil during the *kharif* season.

Immediately after the harvest of the previous crop, plough the land thoroughly to expose the soil to the heat of the sun. In case the land cannot be ploughed in summer, start the ploughings with the onset of the monsoon. The number and depth of ploughings will differ from district to district. But, generally, a single ploughing with an iron plough at six to seven inches depth will suffice.

During the *kharif*, work the soil frequently with a bladed harrow at two to three weeks' interval. In some districts, three to four ploughings with a wooden plough, followed by two to three horrowings are given. These frequent horrowings help the soil absorb more moisture, prevent surface run-off, provide good aeration to the soil and put down weeds. This practice enriches the soil also.

Work the horrow once again in September. This will create good a surface mulch and prevent drying up of the soil just before sowing.

In low rainfall areas, the land is not ploughed. It will be better if you scoop out the soil, to make small hollows, from different places in the field. These hollows will hold rain water. You can also bund your field to prevent surface run-off.

SOW IN TIME

Never miss the correct time of sowing. The second to the third week of October is the best time for sowing.

If you sow the crop too early, the newly-germinated seedlings will suffer badly in the intensive heat of October. Also, post-monsoon rains, if received, are not good for the seed sown. Similarly, if you sow late, the germination of the seed is affected, resulting in poor crop growth. The early hot spells during the ripening period are bad for the crop. Hence, always sow the seed at proper time.

SOW THE RIGHT WAY

For the rainfed as well as irrigated crop, sow the seed using a seed-rate of 40 pounds per acre. That is enough. For sowing, use a two or three-coultered heavy seed-drill, spacing the crop at 10 inches between the rows.

IRRIGATE PROPERLY

The number of irrigations you have to give to the crop will depend on the amount of moisture the soil is able to keep. You may require to give the crop three to four irrigations during its growing period. Give the first irrigation 25 to 30 days after sowing, and the following ones at 3 to 4 weeks interval. See that you do not irrigate your crop heavily. If you do, the crop will produce more straw than grain. Heavy irrigation also makes the crop easily get diseases like rusts and *Alternaria*.

FEED WHEAT HEAVILY

At the end of August or during the first week of September, spread well-decomposed manure evenly on the land and mix it well with the soil by harrowing. Five cartloads for a rainfed crop, and ten for an irrigated one will be sufficient. You can as well raise

Turning in the *sannhemp* crop in the field

sannhemp in kharif to green manure the wheat crop. Apply 100 pounds of phosphoric acid at the time of sowing the green manure crop.

In addition to organic matter, give fertilizers also. Apply 200 pounds of ammonium sulphate and 112 pounds of superphosphate to the irrigated crop.

A rainfed crop responds neither to groundnut cake nor to ammonium sulphate. But under assured rainfall conditions, you can give 100 pounds of ammonium sulphate and 120 pounds of superphosphate with good results. Drill the fertilizer at the time of sowing.

KEEP DOWN WEEDS

Give one or two hand-hoeings to keep down weeds and to conserve moisture.

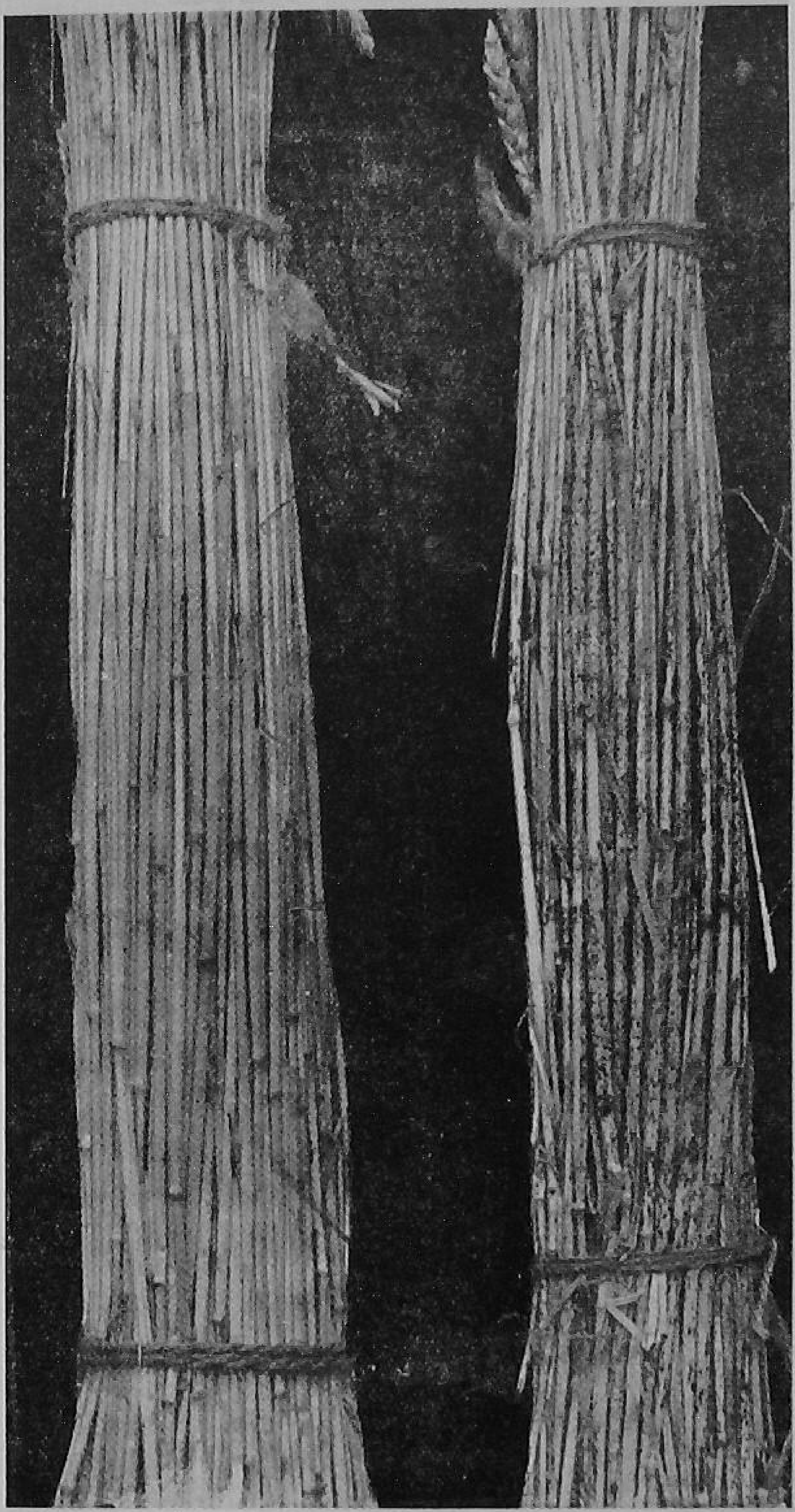
CONTROL PESTS AND DISEASES

Stem-borer: Control it by uprooting and burning the affected plants from the field.

Wheat rusts : Of the two rusts that attack wheat in Maharasthra, black rust is more dangerous. You can control it by dusting the crop with sulphur. The best thing, however, would be to grow rust-resistant varieties.

Root rot or crown rot: This disease attacks the crop just after germination. To control, treat the seed with a mercury compound like 'Agrosan GN' or TMTD at 1 ounce to 20 pounds of the seed.

Loose smut of wheat. To control, treat the seed by solar heat treatment. The treatment consists of soaking the seed in water for four hours in the morning on a clear day of May, removing the seed from water after that and exposing it to the sun in a thin layer till it dries thoroughly.



Rust-free stems — Rust-infected stems

If you notice any affected plant in the field, uproot it and burn.

Follow these practices, and see if the harvest is not bigger and better.

	Strain	Suited to	Approximate duration in days	Average grain yield per acre on Farm. Kg./Lb.	Percentage increase over local	Special features
			T. DURUM			
1.	Motiya (Bansi-168)	Dhulia District for dry cultivation.	127	318/700	10.15	Better grain, pearly, lustrous.
2.	Gulab (Bansi-224)	Jalgaon for dry cultivation	135	340/750	20.00	Yields well on heavy soils slightly bolder and with oily lustre.
3.	Jay (Bansi-pally-808)	Deccan for dry cultivation.	120	240/525	11	Grain bold and of superior quality.
4.	Vijay (Niphad-81)	do.	122	272/600	12.15	Better grain quality, drought-resistant.
5.	PW-1	Kalamnuri in Parbhani Distt.	129	227/500	14	Grows well under drought conditions.
6.	PW-3	Marathwada where soils are heavy.	130	250 to 273 / 550 to 600	10	Yields well on heavy soils.
7.	PW-7	do.	138	227/500	17	Drought - resistant, suitable for dry cultivation, fetches high value in the market.
8.	N-59	Poona, Dhulia, Jalgaon, Nasik.	120	226/586	12 to 15	Highly stem - rust-resistant.
9.	N-125	do.	120	321/707	30 over N-81	do.
10.	N-271	Under trial.	124	341.36/751	25 over Vijay	do.
11.	N-974	do.	122	318.18/700	16 over Vijay	do.
12.	N-1200	do.	122	259.09/570	Equal to Vijay	do. do.
13.	NI-146	Poona, Nasik, Jalgaon.	128	514/1,134	Equal to N-4	do.
14.	NI-973	Under trial.	126	602.27/1,325	10 over N-4	do.

Economic Characters of Improved Wheats in Maharashtra

	Strain	*Suited to*	*Approximate duration in days*	*Average grain-yield per acre on Farm Kg./Lb.*	*Percentage increase over local*	*Special features*
15.	Baxi-288-18	Nasik, Ahmednagar Distts.	140	771/1,700	12	Best quality wheat, highly susceptible to rust.
				T. VULGARE		
1.	PW-5	Marathwada where soils are heavy.	133	340 (Dry)/750	22	Responds well to irrigation, susceptible to rust.
2.	Niphad-4	Western Maharashtra.	122	540/1,200	—	Better grain quality, rust - tolerant, good baking and milling quality.
3.	Kenphad-25	Deccan.	136	681/1,500	—	Highly stem - rust-resistant.
4.	N-177	Ahmednagar districts.	130	622 to 794 / 1,370 to 1,750	17	Highly rust - resistant, and tolerant to *alternaria*.
5.	N-345	Nasik, Kolhapur, Dhulia Jalgaon.	130	604 to 784 / 1,330 to 1,725	14	Better grain quality, rust - tolerant, good baking and milling quality.
6.	N-179	Irrigated tracts.	130	657/1,446	23 over N-4	do.
7.	HY-65	do.	130	272 (Dry)/600 907 (Irri.)/2,000	— 15	Resistant to stem-rust.
8.	NP-710	do.	—	204 (Dry)/450 680 (Irri)/ 1,500	—	Rust - tolerant, highly resistant to loose smut.
				UNDER DISTRICT TRIAL		
9.	NI-284-S	Under trial	135	636.3/1,400	17 over N-4	Highly resistant to stem-rust.
10.	NI-917	do.	127	681.8/1,500	25 over N-4	do.

WHEAT GAINS MORE GROUND IN WEST BENGAL

By N. MITRA

With just over 85,000 acres under wheat, yielding about 25,000 tons a year, West Bengal imports as much as 7 lakh tons of wheat each year to feed her population. But wheat cultivation getting more and more popular in the *rabi* cropping programme with irrigation water available from D. V. C. and Mor projects and especially in deep tubewell-irrigated areas.

WITH just about 85,000 acres under wheat, yielding about 25,000 tons a year, West Bengal imports as much as 7 lakh tons of wheat each year to feed her population. Wheat cultivation, however, is getting more and more popular in *rabi* cropping programme with irrigation water available from D.V.C. and Mor Projects and especially in deep tube-well irrigated areas.

In growing wheat, West Bengal farmers are being asked to follow these important tips.

LAND

Select a highland loamy soil, with good irrigation and drainage facilities.

MANURES AND FERTILIZERS

Give 75 maunds of farmyard manure or compost, 2 maunds of superphosphate and 30 seers of ammonium sulphate or 15 seers of urea per acre, as a basal dose.

For top-dressing, give either 30 seers of ammonium sulphate or 15 seers of urea per acre.

VARIETIES

Grow one of these important, rust-resistant varieties of wheat.

(i) *N.P. 710* —For Howrah, Hooghly, Nadia, Murshidabad and Burdwan (eastern part) Districts.

(ii) *N.P. 798* —For Birbhum, Bankura, Midnapore, Purulia, Malda, West Dinajpur, Cooch Behar, Burdwan (western part) and Darjeeling (plains only) Districts.

Better cultural practices will lead to better wheat harvests

(iii) *N.P. 781* —For the hill areas of Darjeeling District.
N.P. 809
Ridley

SOWING

Sow the seed during November, excepting in areas where wheat follows early *aman* paddy.

Use seed-drills for sowing, giving a spacing of 9 to 12 inches between rows. Keep the seed-rate at 25 to 30 seers an acre.

INTERCULTURING

Use a wheel-hoe for weeding after a month of sowing. Thin out the plants so as to have a spacing of two to three inches between every two plants in a row.

TOP-DRESSING

After 2 to 2½ months of sowing, top-dress with fertilizers. Follow it up with mulching by a wheel hoe.

IRRIGATION

Irrigate the crop two to three times as and when necessary.

DISEASES AND PESTS

Treat the seed before sowing with 'Agrosan G.N.' to avoid stem rot and leaf spot diseases.

HARVESTING

Harvest the crop when it is well-matured.

By G. A. PATEL

Gujarat has a 'PILOT' WHEAT SCHEME

THE Gujarat Department of Agriculture is not content with the average of 400 to 600 pounds that farmers obtain from an acre of dry wheat, or the 1,000 to 1,200 pounds an acre, they get from the irrigated wheat.

All the wheat farmers of the State are, therefore, being advised to take to improved practices, which can raise yields many times more.

For this purpose, the Department is working a Pilot Scheme for irrigated wheat that has already helped many farmers raise high yields, some having recorded as much as 4,900 pounds of grain an acre.

Of Gujarat's cropped area of 244 lakh acres, only 13 lakh acres are under wheat. Sixty per cent of this is under dry and 40 per cent under irrigated wheats. The important local varieties of dry wheats are *dhola-katha* and *rata-katha* belonging to the *durum* group. The irrigated wheats belong to the *vulgare* group and are known locally as *Chandusi*, *Pisi*, *Sarbati* etc.

As a dry crop, wheat is generally raised after *kharif* fallow, whereas irrigated wheat is raised as a second crop after the harvest of the *kharif* crops. Here are the more important things farmers are asked to do under the Pilot Scheme.

RAISE A GREEN MANURE CROP

Raise a *kharif* legume or a green manure crop before taking up the wheat crop.

While sowing the green manure seed of sannhemp, apply 20 pounds of phosphoric acid and then there will be no need for any cattle manure for this crop.

Plough under the green manure crop after four to six weeks' growth.

Give two ploughings and two harrowings to the land. Apply five to ten cartloads of well-rotted farmyard manure.

USE IMPROVED SEED

Select your wheat seed from the following varieties. Consult your Agricultural Officer or the Gram Sevak in the selection.

N.P. 710, *N.P. 718*, *KCN-133* for irrigated areas.

Arnej-206 (Amber), *Arnej-624* (Red) for dry areas.

Select pure, plump and healthy, seeds. Treat them, before sowing with, 'Agrosan GN' or 'Ceresan' (2 to 3 ounces for 60 pounds of seed) against the diseases that are spread by the seed.

For dry wheats, sow 40 pounds of seed with a spacing of 12 to 15 inches in between the rows. And for irrigated wheats, use 60 to 80 pounds with a spacing of 9 to 12 inches. Do not sow cross-wise.

APPLY ENOUGH FERTILIZERS

In irrigated lands, give 40 pounds of nitrogen (in the form of ammonium sulphate) and 20 pounds of phosphoric acid (in the form of superphosphate) except when you are taking wheat after a green manure crop.

Apply phosphatic fertilizer before sowing, at the time of preparatory tillage. Apply ammonium sulphate in two equal doses—the first one at the time of sowing and the second three weeks later.

Place superphosphate near the root-zone of the crop with the help of a seed-drill. Do not broadcast the fertilizer.

In case you are growing wheat under dry conditions, give 10 to 20 pounds of nitrogen

per acre (in the form of ammonium sulphate) at the time of sowing; but make sure that there is enough moisture in the soil then.

IRRIGATE IN TIME

When and how much to irrigate depends on the type of soil and climatic conditions. Normally, you can give seven to ten irrigations at intervals of seven to ten days.

Do not flood the field. Prepare long, narrow or rectangular flat beds depending on the level of the soil to help you give even irrigations.

In the irrigated fields, intercultivate once or twice. Control the weeds by spraying 2,4-D, at 1½ to 2 pounds of the chemical. Spray it four to five weeks after sowing.

CONTROL PESTS AND DISEASES

Rusts are the major enemy of the irrigated crop. To avoid rust damage, grow rust-resistant varieties.

Among pests, rats and surface grasshoppers cause the major trouble. Rats generally attack the crop when it is ready for harvest.

To control rats, prepare poison baits with zinc phosphide mixed with flour. Mix 2½ *tolas* of zinc phosphide with a half-pound of wheat flour, and prepare small pellets from the mixture. Place these near rat burrows in the field. For first two days keep only ordinary flour pellets near the burrows. See which ones are eaten by rats. Place poison pellets in these places on the third day and, if necessary, on the fifth day also.

You can also control rats by fumigating the burrows with cyanogas dust (one ounce of dust per burrow) with the help of a fumigator pump. Close up all the treated burrows with moist earth.

To control surface grasshoppers, apply 5 or 10 per cent BHC dust at the rate of 15 to 30 pounds per acre. You can also use poison baits to control the hoppers.

HARVEST IN TIME

While harvesting the crop, see that it is not over-mature, as, otherwise, there will be a loss of grain due to shedding.

After harvesting the crop, thresh it with the help of an Olpad Thresher. This will save your time, labour and money as compared to trampling with bullocks.

FOLLOW A GOOD ROTATION

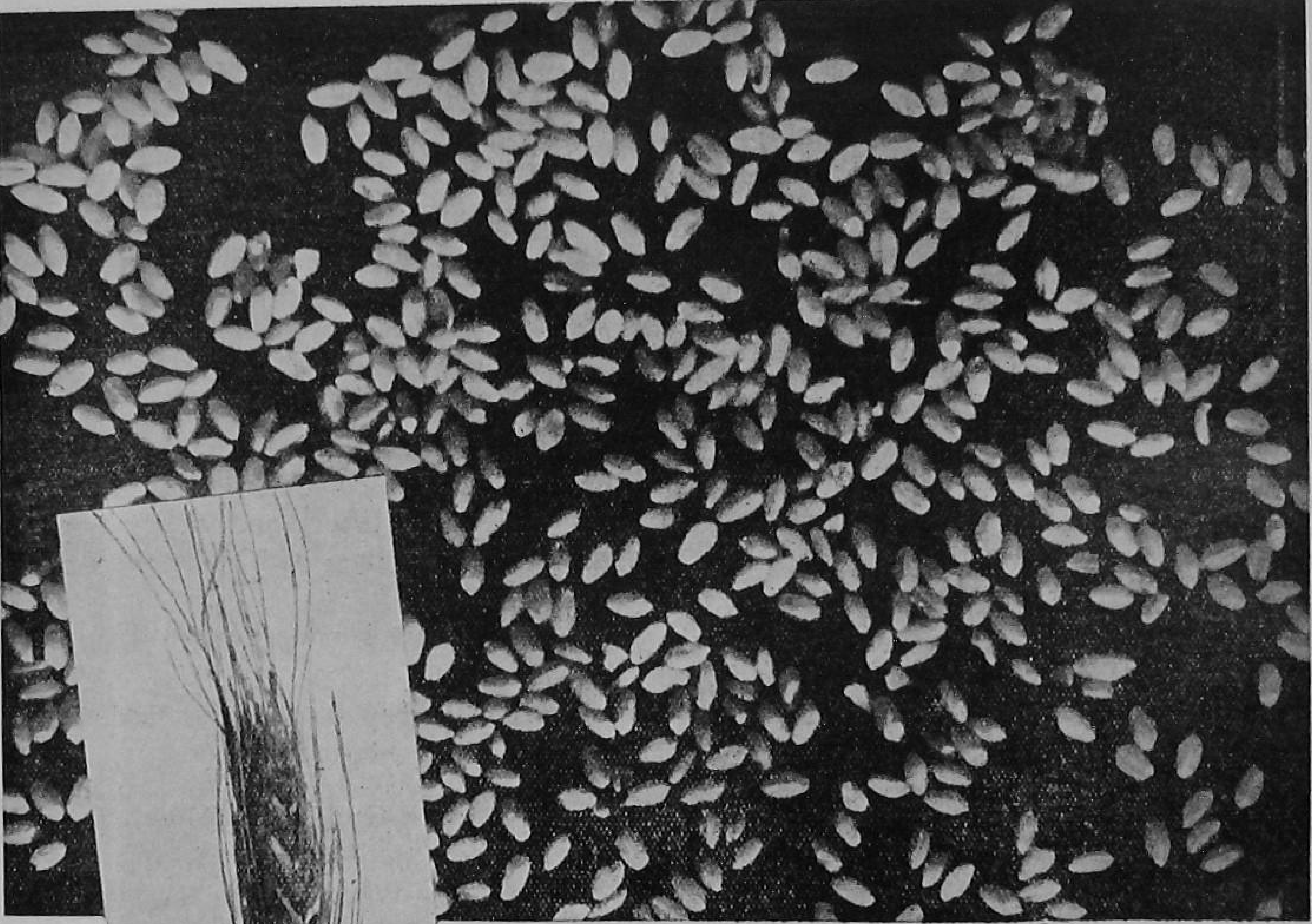
To get the best out of your field, follow any one of these crop rotations.

1. *Bajra* or Groundnut–Wheat
2. *Jowar* or Cotton—*Kharif* fallow—Wheat (dry)
3. Rice—Gram or Wheat
4. Maize—Gram or Wheat

Follow these improved agricultural practices and you will get 2,000 to 2,500 pounds of wheat per acre as compared to 1,000 to 1,200 pounds per acre.

Why, there are some progressive farmers who have even obtained yields of 4,900 pounds per acre in the State Crop Competitions by following these improved practices !

PUNJAB'S IMPROVED WHEATS—ONE REASON FOR HIGHER YIELDS



By PRITAM SINGH DIOL, GURCHARN SINGH and AVTAR SINGH

SINCE Independence, the average per acre yield of wheat in the Punjab has risen to as much as 1,088 pounds, and according to the agricultural experts of the State, nearly 25 per cent of this increase is due to the spread of improved wheat varieties.

The Punjab Agriculture Department has evolved a number of new wheats, and today,

every climatic region of the State has an improved wheat variety suitable for it. The work of breeding new wheats continues unabated, and newer wheat varieties, better than the existing ones in many respects are being released frequently.

Here are some improved wheat varieties, released in the Punjab after 1947 and some of the newer ones which are undergoing final yield trials.

THE NEW WHEATS

C. 281. A cross between *I.P. 4* and *C. 591*, it is a bearded type with felted glumes and is very early maturing. The grains are bold and flinty, possessing excellent baking quality.

It is susceptible to all the fungal diseases and is meant for cultivation in the south-eastern districts of the State under all conditions. It has, in fact, replaced *C. 591* and *C. 518* totally in these areas.

C. 273. A cross between *C. 209* and *C. 591*, it is a fully bearded variety with long and mid-dense ears which have white and felted chaff. It has bright, amber, hard and shapely grains.

It is resistant to lodging and is earlier in maturity than *C. 518* by a few days. It has excellent milling, baking and *chapati* making qualities and is moderately resistant to rusts and loose smut.

It is recommended for cultivation on average to rich lands of central districts under irrigated conditions and on rich lands of sub-montane districts of the Punjab. It has replaced *C. 591* and *C. 518* in the central districts.

C. 286. A multiple cross of *C. 250* and *C. 591* (*Pb. Type I* x *Khapli*), it is a fully bearded variety with white, smooth glumes, and possesses bold, flinty and amber-coloured grains. It is highly resistant to yellow rust and fairly resistant to black rust and loose smut. It matures earlier than *C. 250* by a few days.

It is recommended in place of *C. 250* for sowing under all conditions except on the rich lands of sub-montane districts, and for late sowing in place of *C. 228* in irrigated lands of central districts.

C 253. A cross of *Pb. 25* and *I.P. 165*, it is cultivated in the lower hills of Kangra, Hoshiarpur, Ambala, Patiala and Simla Districts.

It is a beardless type with white, smooth glumes, and its straw is strong and resists lodging considerably.

It is resistant to yellow rust and loose smut attack, but is highly susceptible to black rust. Its grains are amber and semi-flinty. It is early in maturity and easy to thresh.

It is now recommended for general sowings in the high hills of Kulu Valley and also in place of *C. 224* which has become highly susceptible to bunt and other fungal diseases.

C. 285. A cross of *C. 228* and *B. 256* (Kenya wheat), it is cultivated in the Lahaul and Spiti Valleys of Kangra District, where wheat is grown during summer at an altitude of 10,000 to 11,000 feet.

It is a bearded variety and possesses mid-long, lax and smooth white ears. It is earlier than *C. 591* in maturity and possesses bold, amber grains of good quality.

It possesses heavy tillering capacity and weak straw. In the early stages of its growth, it presents a 'grassy' appearance. Its remarkable resistance to various strains of yellow

and black rust makes it specially suitable for high altitude conditions where black rust is a great trouble.

THE FUTURE WHEATS

The following wheats are now in the comparative yield tests for final selection to replace the existing types in the coming years.

C. 203. A derivative of the cross *Cul. 5 x C. 273.* It is a fully bearded strain and possesses attractive, fairly long and lax ear-heads. It is a tall-growing wheat and possesses hairy glumes.

It is strong stemmed and hence, does not lodge. Due to its good performance in the past, it is expected to replace *C. 273* under conditions of high fertility.

Many new wheats, high in yield and resistant to diseases, are being evolved in the Punjab.

C. 303:—A derivative of the cross *C. 286* and *C. 273*, it combines well the rust and loose smut-resistance of *C. 286* with the strength of straw of *C. 273*.

It is fully bearded, and possesses white and hairy glumes. It possesses a good tillering capacity and has done well under normal sown, late-sown and *barani* (rainfed) conditions of sowings.

C. 305:—A derivative of the cross *C. 286* and *C. 518*, it possesses almost the same good characters as *C. 303*, with the only difference that its head is not as lax but is medium dense instead. It is meant for normal sowing and has been found to be next to *C. 306* in yield performance during 1960-61.

C. 306 :—It is developed from a multiple cross of (*CW. 1974* x *Chz. No. 3*) x *C. 591* x (*P. 19* x *C. 228*).

It is a bearded wheat with white chaff and hairy glumes. It has a high tillering capacity and resists lodging considerably.

Grains are bold, amber and free from mottling. It possesses a high resistance to rusts especially to yellow rust. It is a universal wheat and is meant for general sowing in rich lands and under normal-sown, late-sown and rainfed conditions.

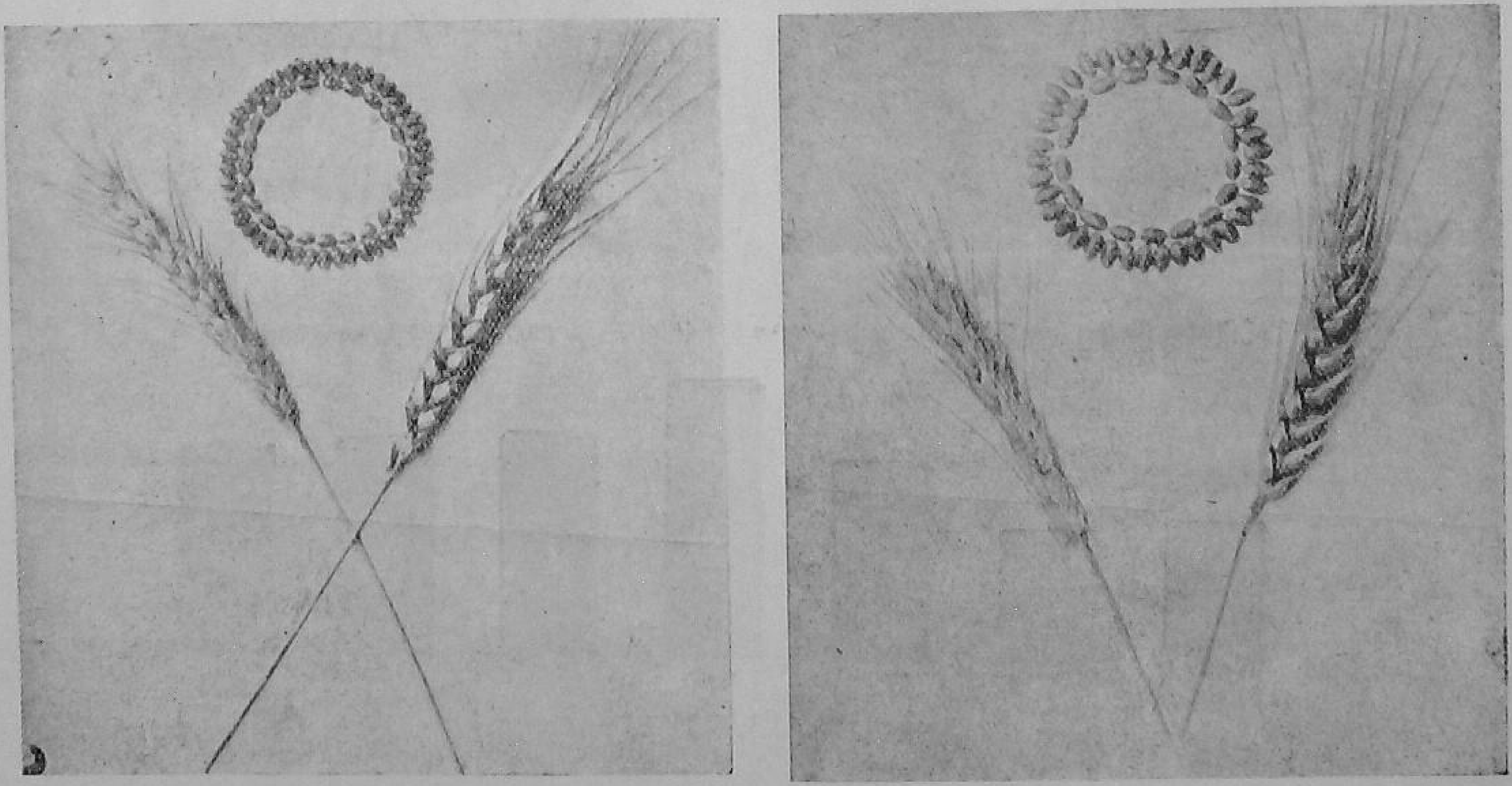
C. 307:—It is a derivative of the cross *C. 250* x *Trigo Centeria.* It is a bearded type with smooth white glumes. The earheads are long, lax and oblong in shape.

The grains are very attractive, bold (almost double the size of *C. 518*) and deep glossy amber in colour.

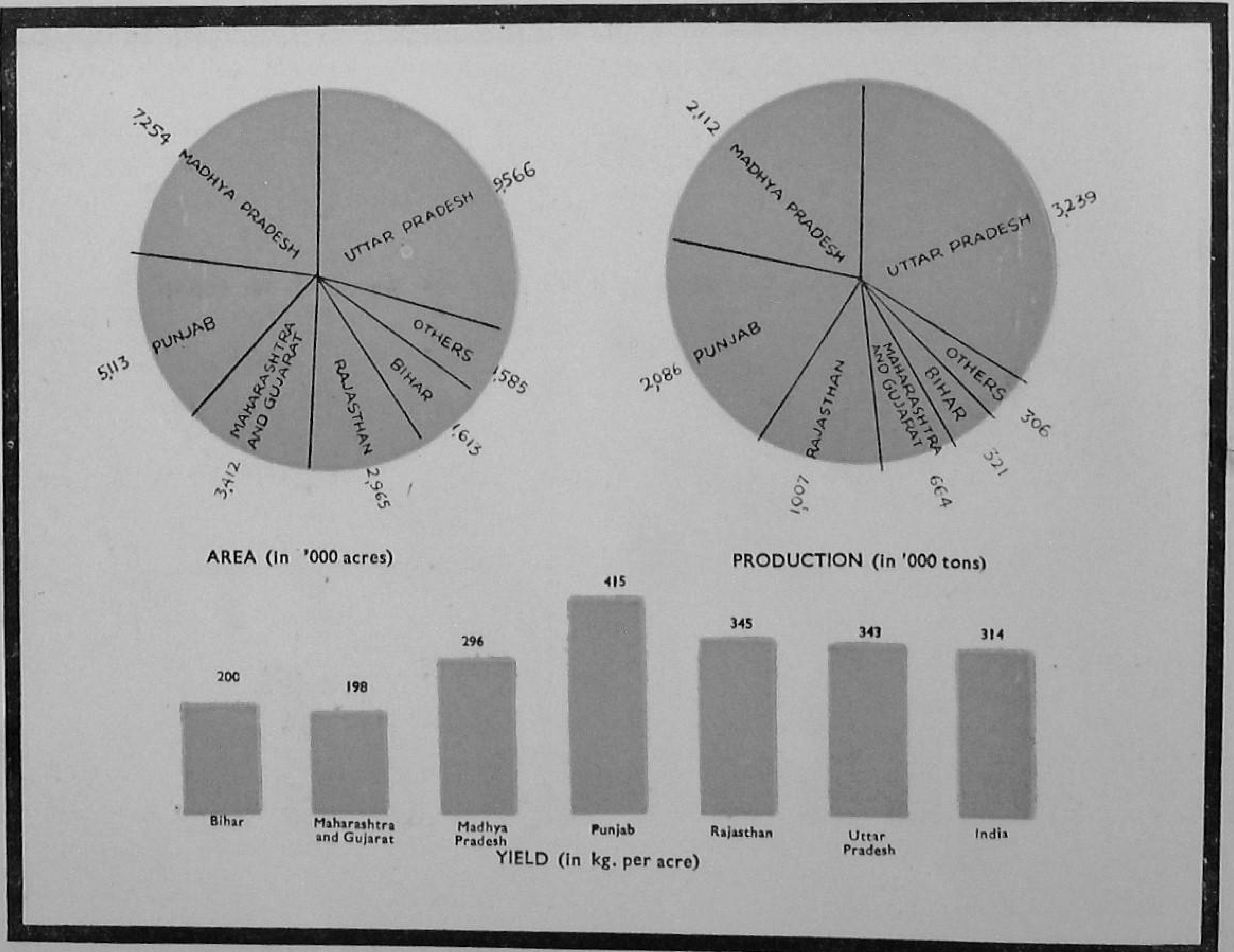
Being strong-stemmed, it resists lodging. It is completely resistant to all the rusts but is moderately resistant to loose smut.

It has done better than *C. 286*, both under irrigated and rainfed conditions, during the past few years. It is a definite improvement over *C. 286*.

Two improved wheats of the Punjab—*C. 273* (left) and *C. 286* (right)



WHEAT IN INDIA (1959-60)

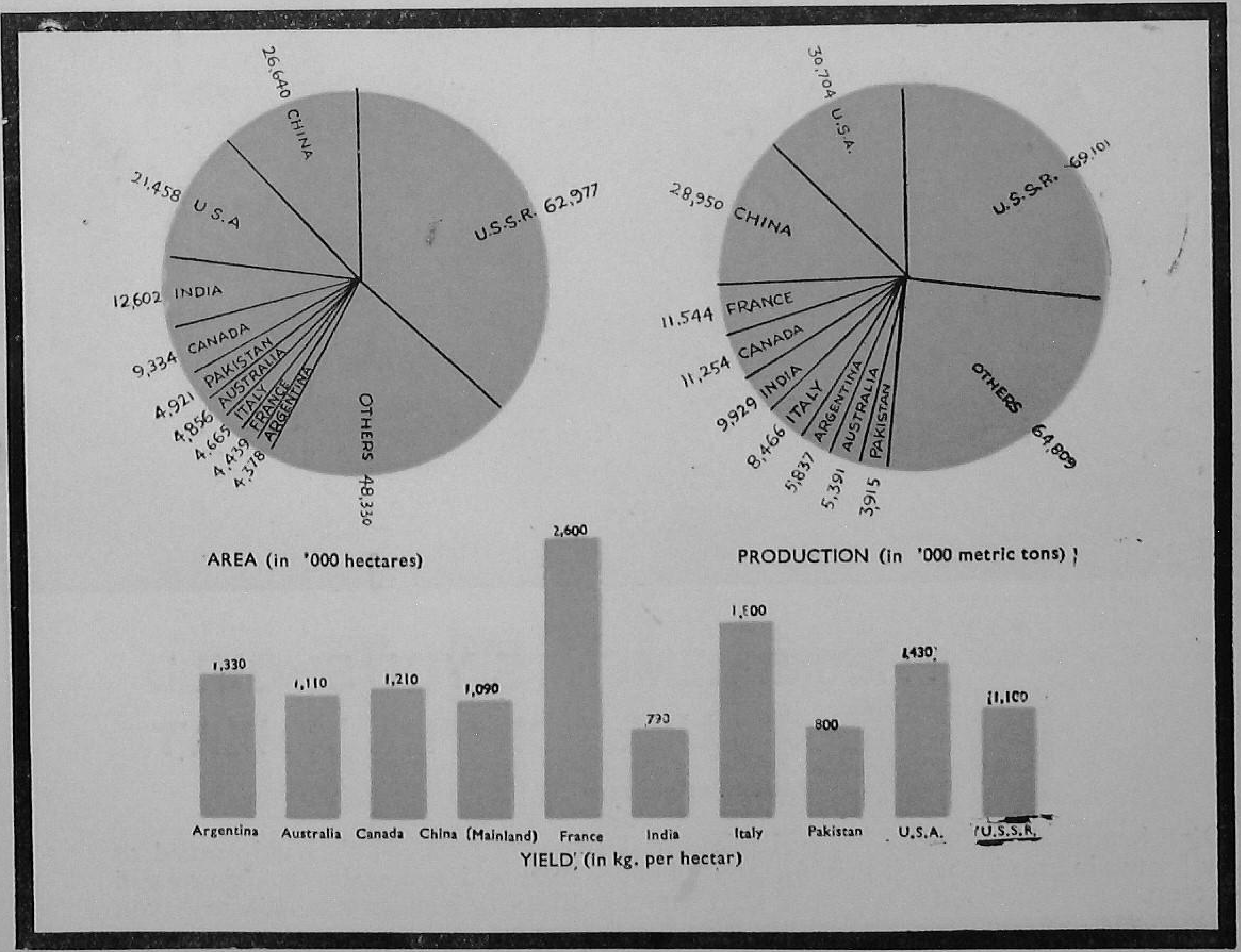


Wheat in India and abroad

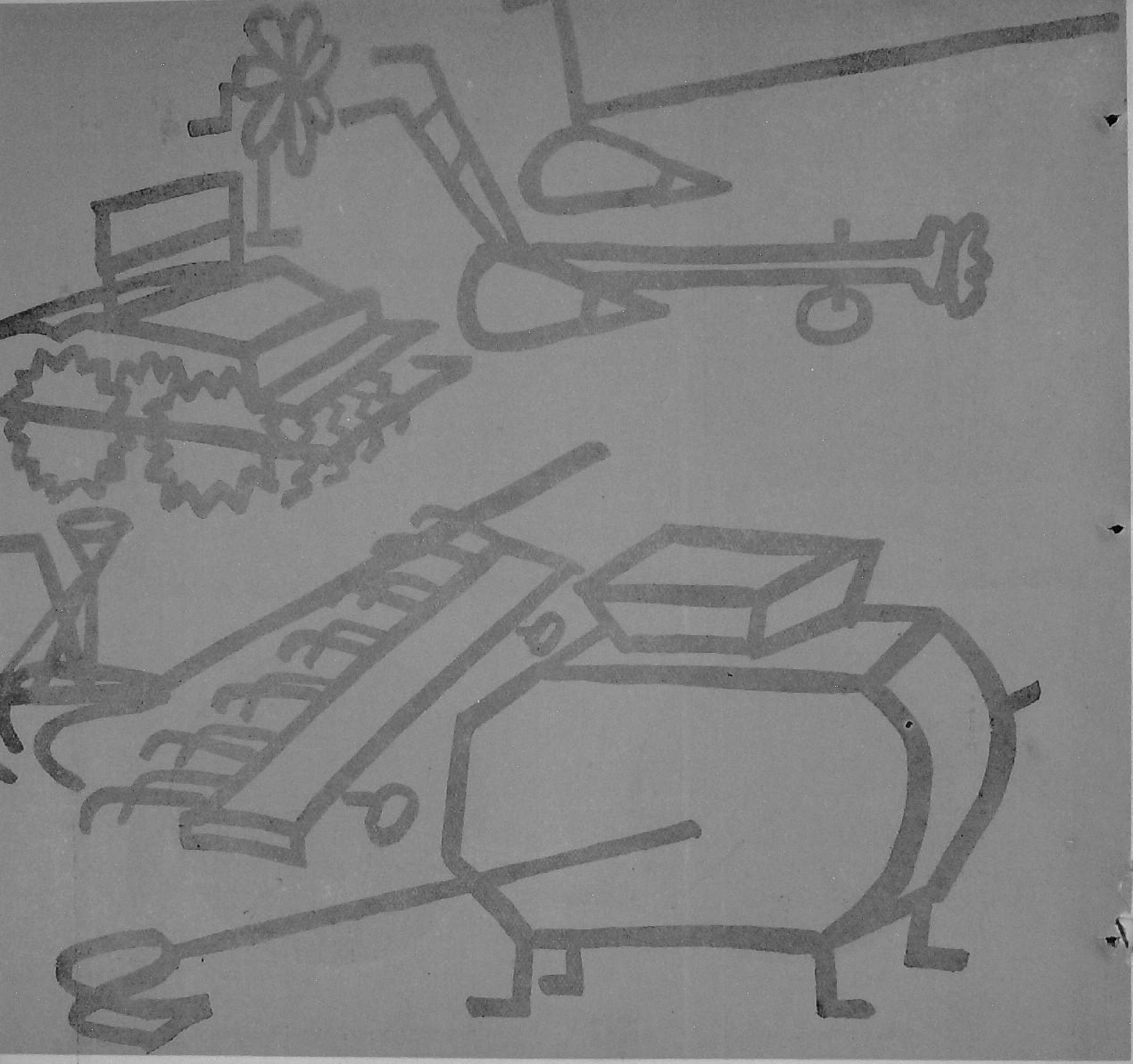
By S. RAMASWAMI

WHEAT one of the earliest crops under cultivation, now contributes about 13 per cent of the total food-grain production in India and 16 per cent of her total cereal production. The production increased by 21 per cent between the First Plan and Second Plan periods, which is the highest increase recorded for any foodgrain during this period. The area during the same period increased by 19.4 per cent, thus making for a 1.6 per cent increase in yield.

WHEAT IN THE WORLD (1959-60)



Figures for China (Mainland) are for the year 1958-59



THE IMPLEMENTS YOU SHOULD USE FOR THE WHEAT

By D. N. KHERDEKAR

MORE improved implements are available to you for use in growing wheat than for any other crop.

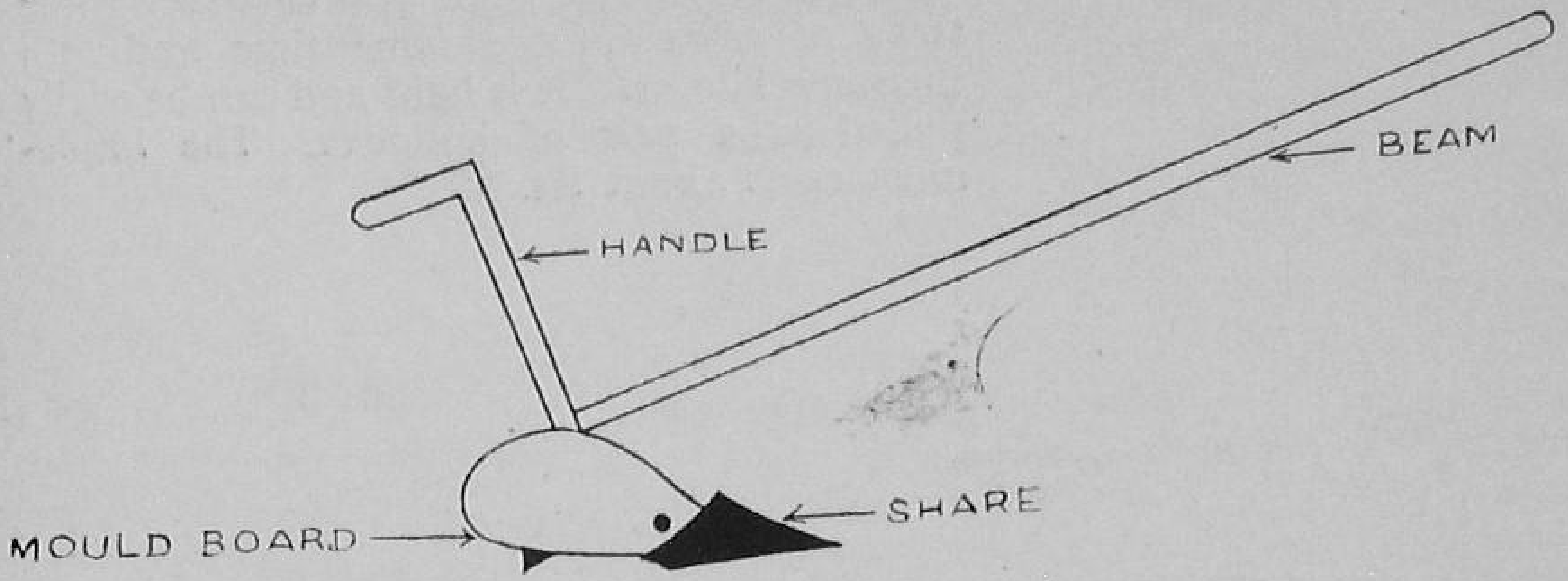
These vary from simple hand-worked or bullock-drawn implements to power and tractor-driven implements. Where you

have large fields or where co-operative farming is followed, you can use power machinery as they do in the western districts of Uttar Pradesh and the Punjab. Here a large number of wheat farmers own tractors and tractor-drawn machinery as well as power-driven centrifugal pumps for irrigation purposes.

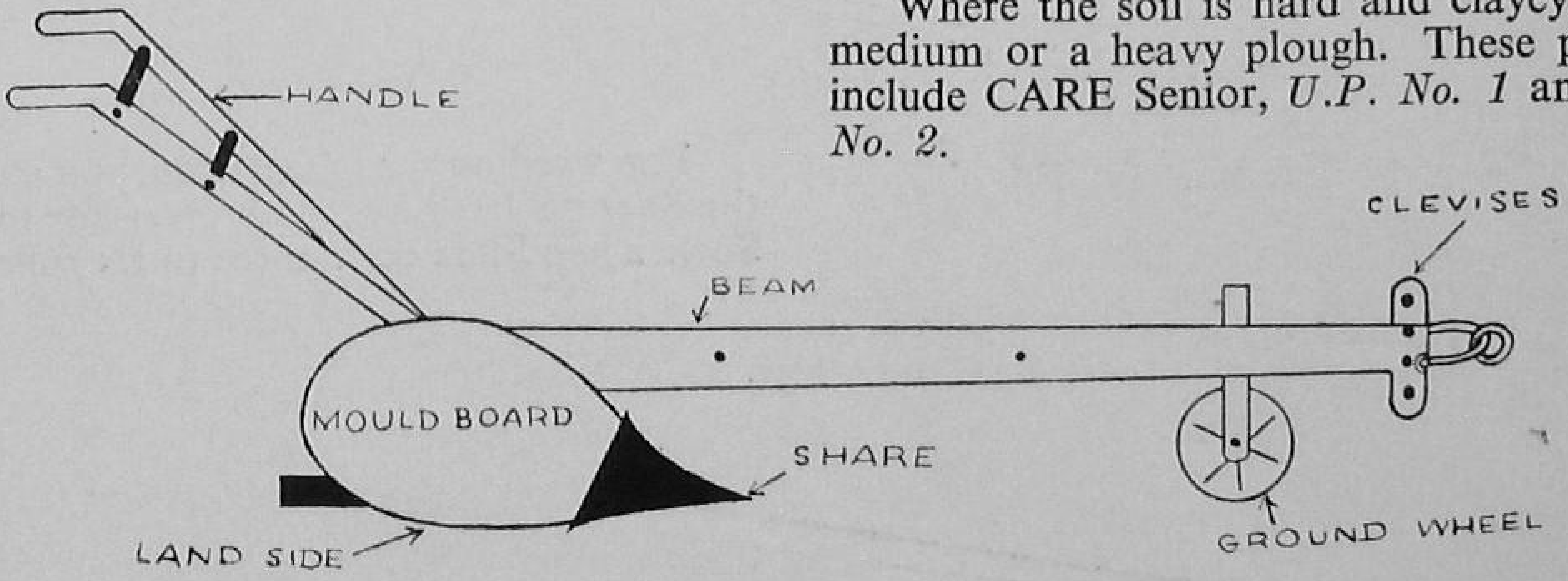
Among the simple types of implements which do not need power to work them include ploughs, levellers, seed-drills, threshers and winnowers. Most of the machinery and the implements are now being made in India, and you can get them quite cheap.

The simple manually-operated or bullock-drawn implements are useful to wheat farmers who own less than ten acres of land.

For opening up the land, light ploughs such as Meston, CARE Junior, and *Shabash* are already popular, and you will find them useful too.

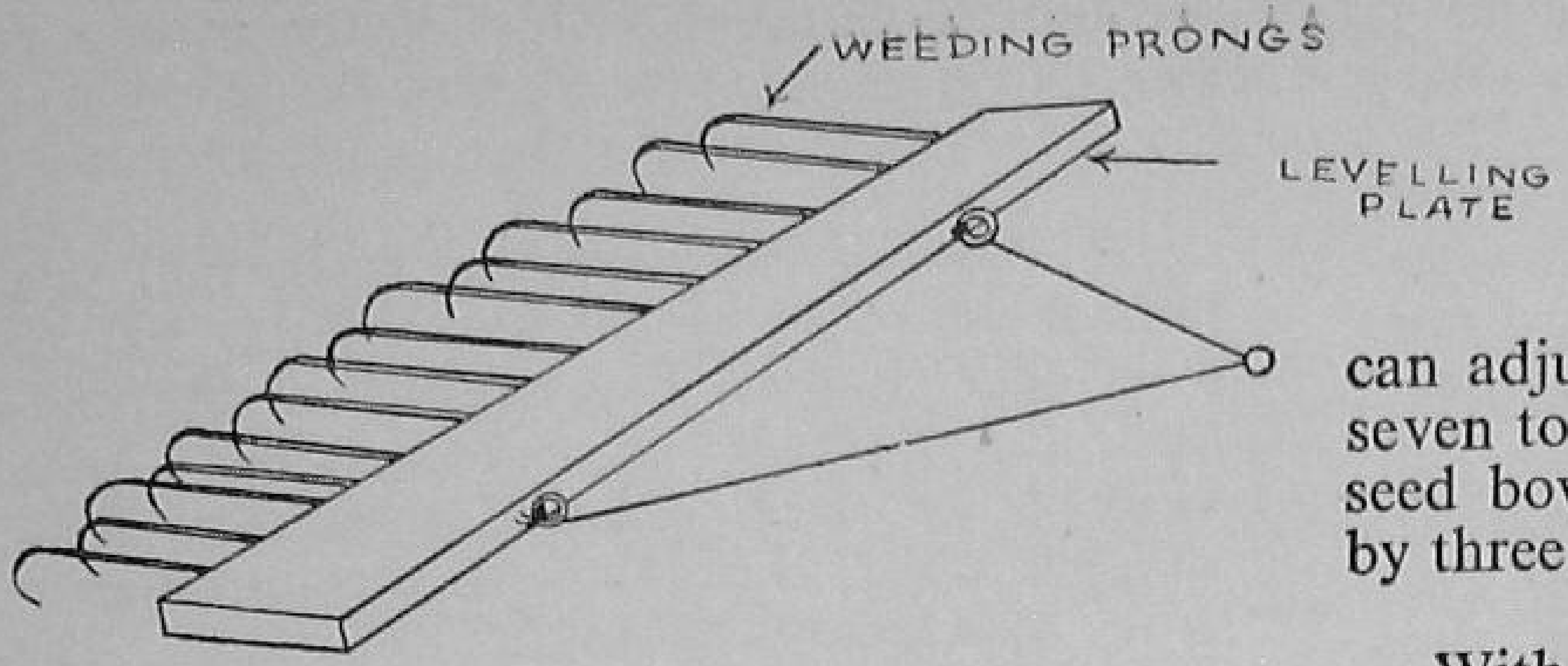


Where the soil is hard and clayey, use a medium or a heavy plough. These ploughs include CARE Senior, *U.P. No. 1* and *U.P. No. 2.*



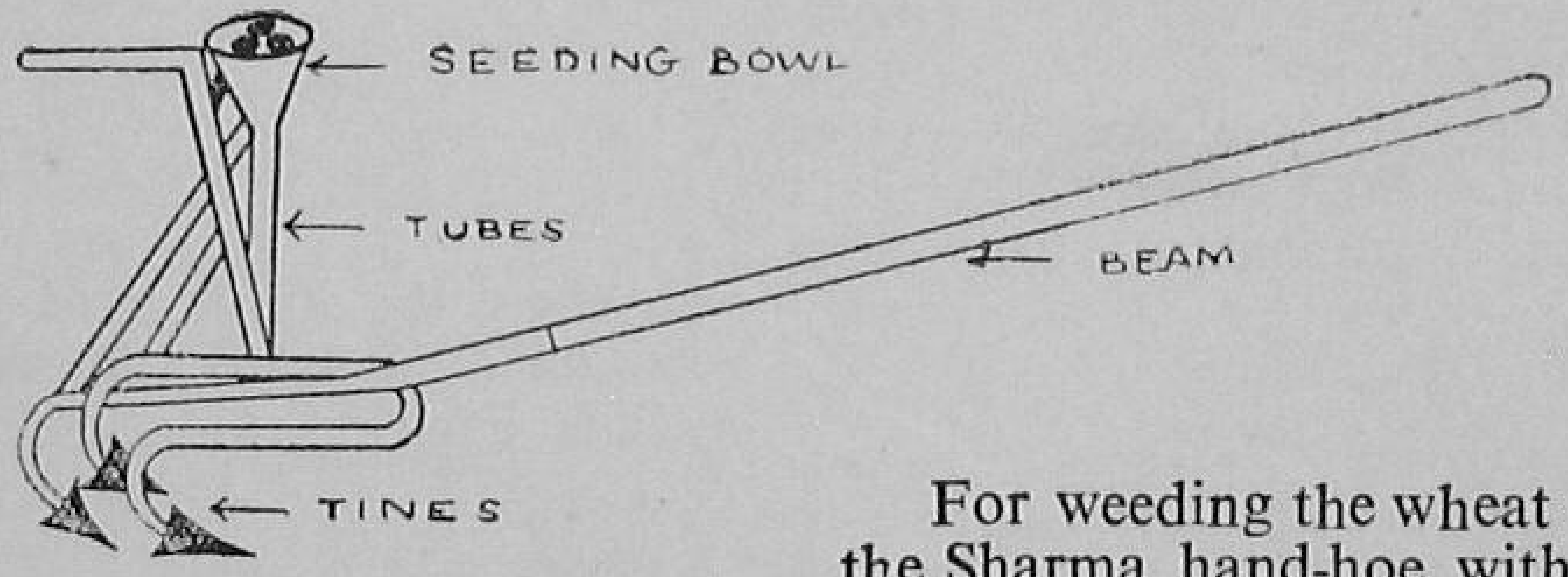
After the land is ploughed, and you want to break and pulverize the clods, you should use a very good implement called *Singh Patela.* This is available in sizes ranging from to 3 to 8 feet, and costing Rs. 30 to 60 according to the size. The *Patela* can be easily pulled by a pair of ordinary bullocks. It not only crushes the clods and levels the land, but also collects the weeds and trash for you to remove or destroy.

After the land is ready, you should use a *triphali* or a three-tined cultivator having a seeding attachment for sowing seed. You

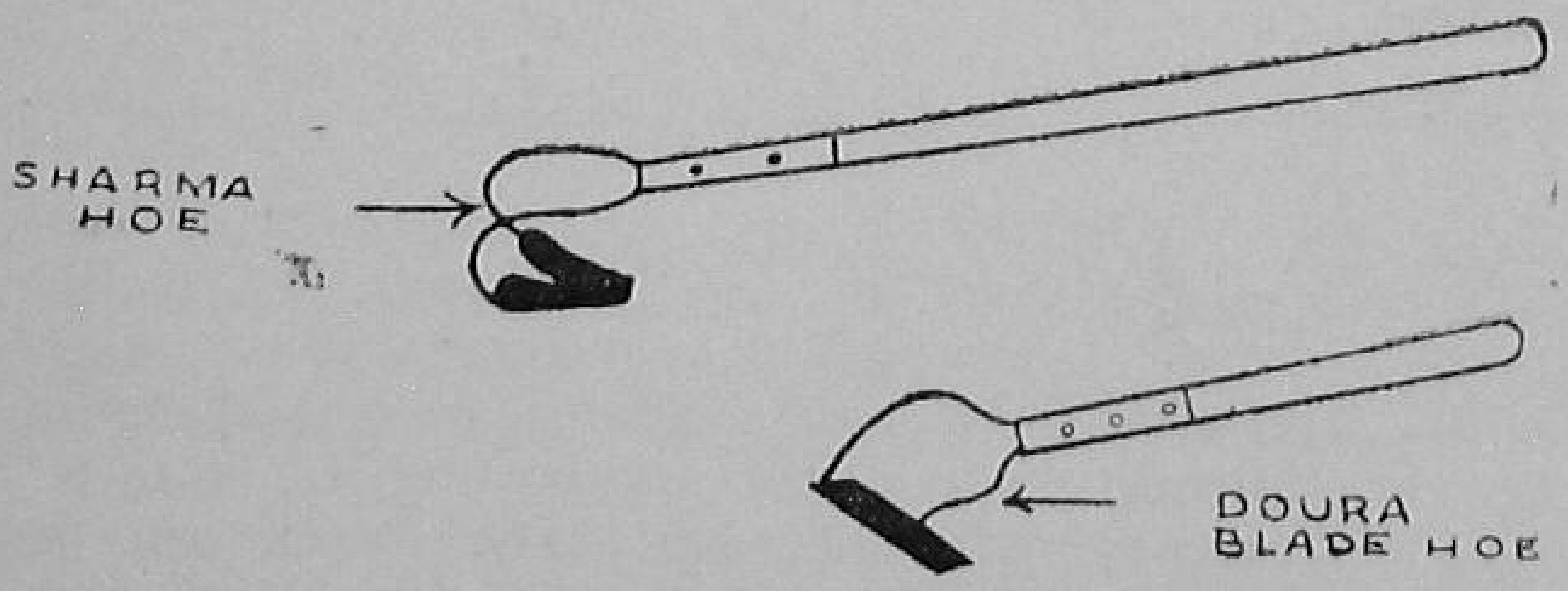


can adjust the distance between tines from seven to nine inches. Put the seed in the seed bowl which has three holes, connected by three tubes to the tines.

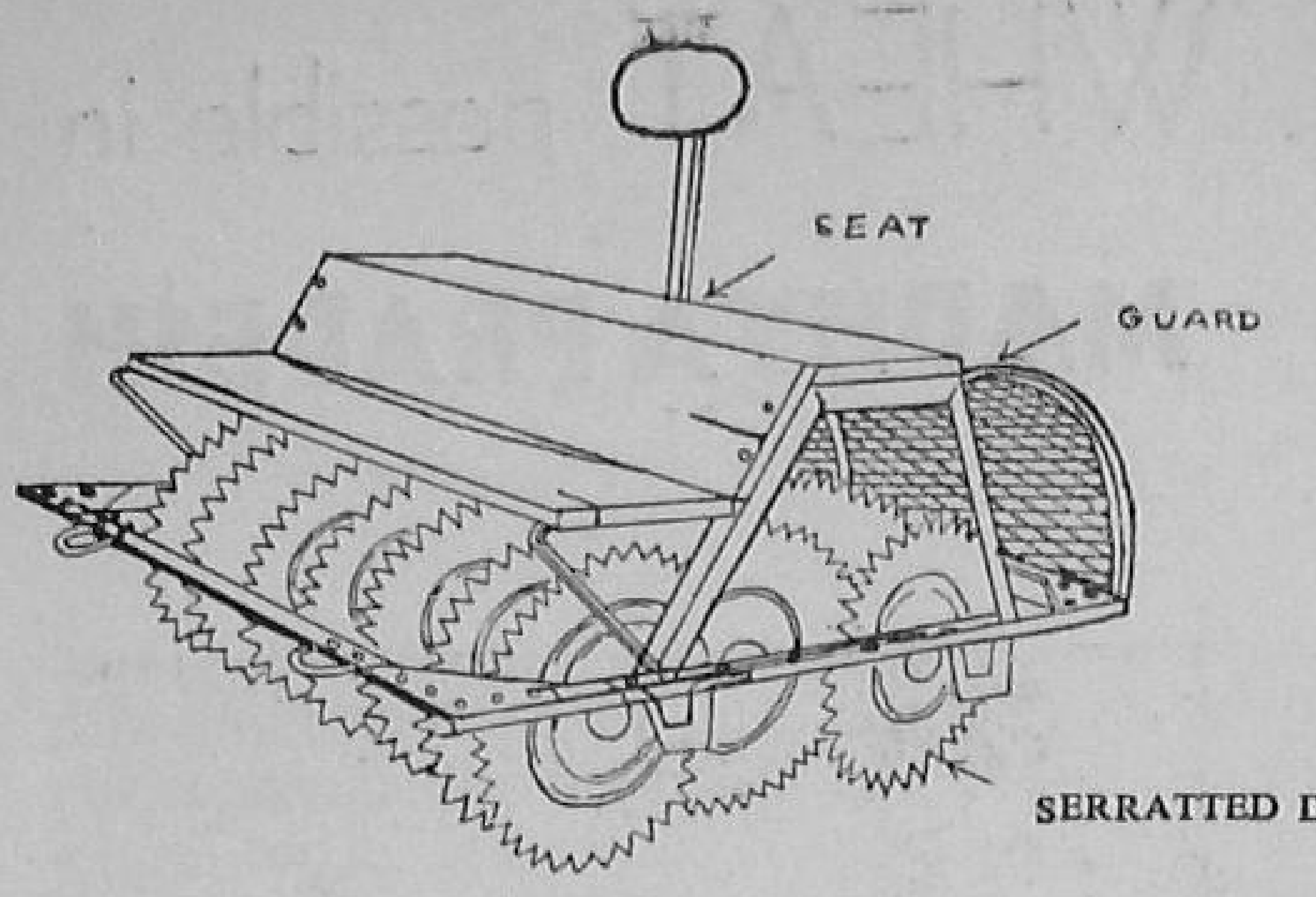
With this implement, you can sow three rows of wheat at the same time and with the same labour. It is light and can be easily pulled by a pair of bullocks. The implement costs about Rs. 55.



For weeding the wheat crop, you can use the Sharma hand-hoe with great advantage. Such a hand-hoe costs three to six rupees.

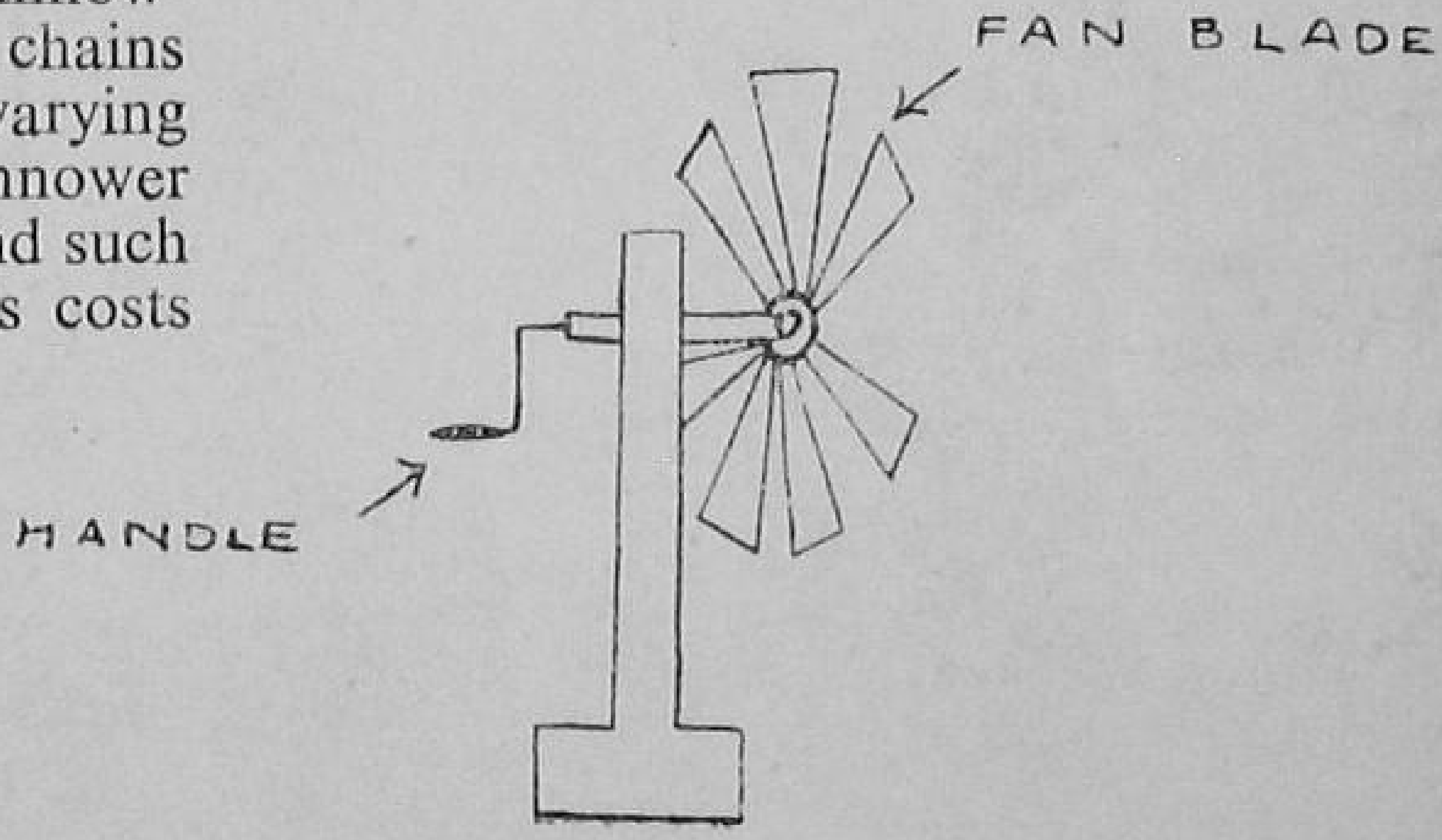


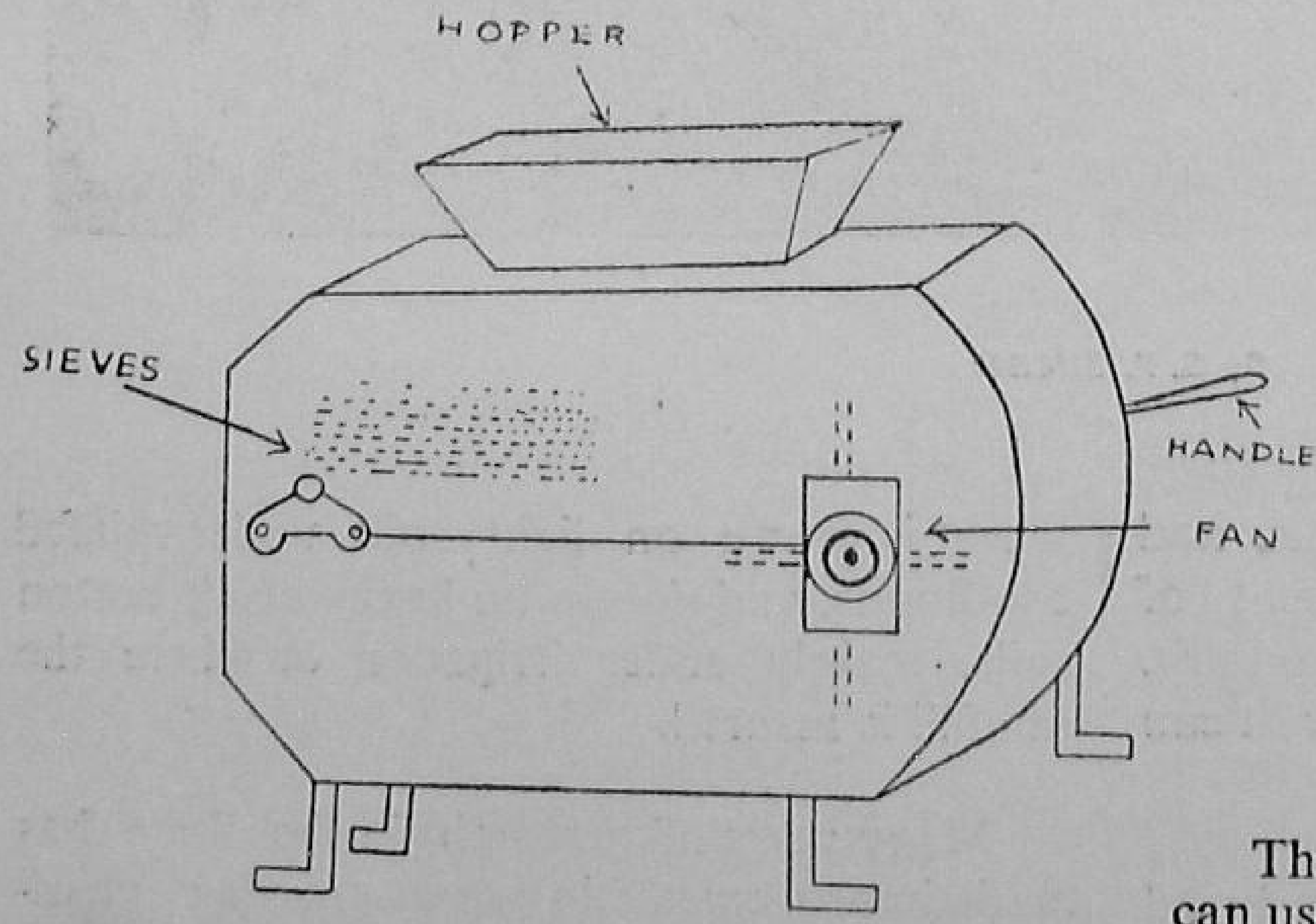
For threshing your crop, you can use the Olpad thresher, which has 11 to 21 serratted and sharp discs. These discs are mounted on 2 or 3 axles on a frame. A guard and a seat is provided for the driver to sit on.



A pair of bullocks can easily pull this implement. The thresher costs Rs. 300 to 400. The Punjab Department of Agricultural Engineering has also designed a portable power-driven wheat thresher. You can work this thresher with the power provided by a tractor having 25 to 30 H.P. The thresher costs Rs. 3,000.

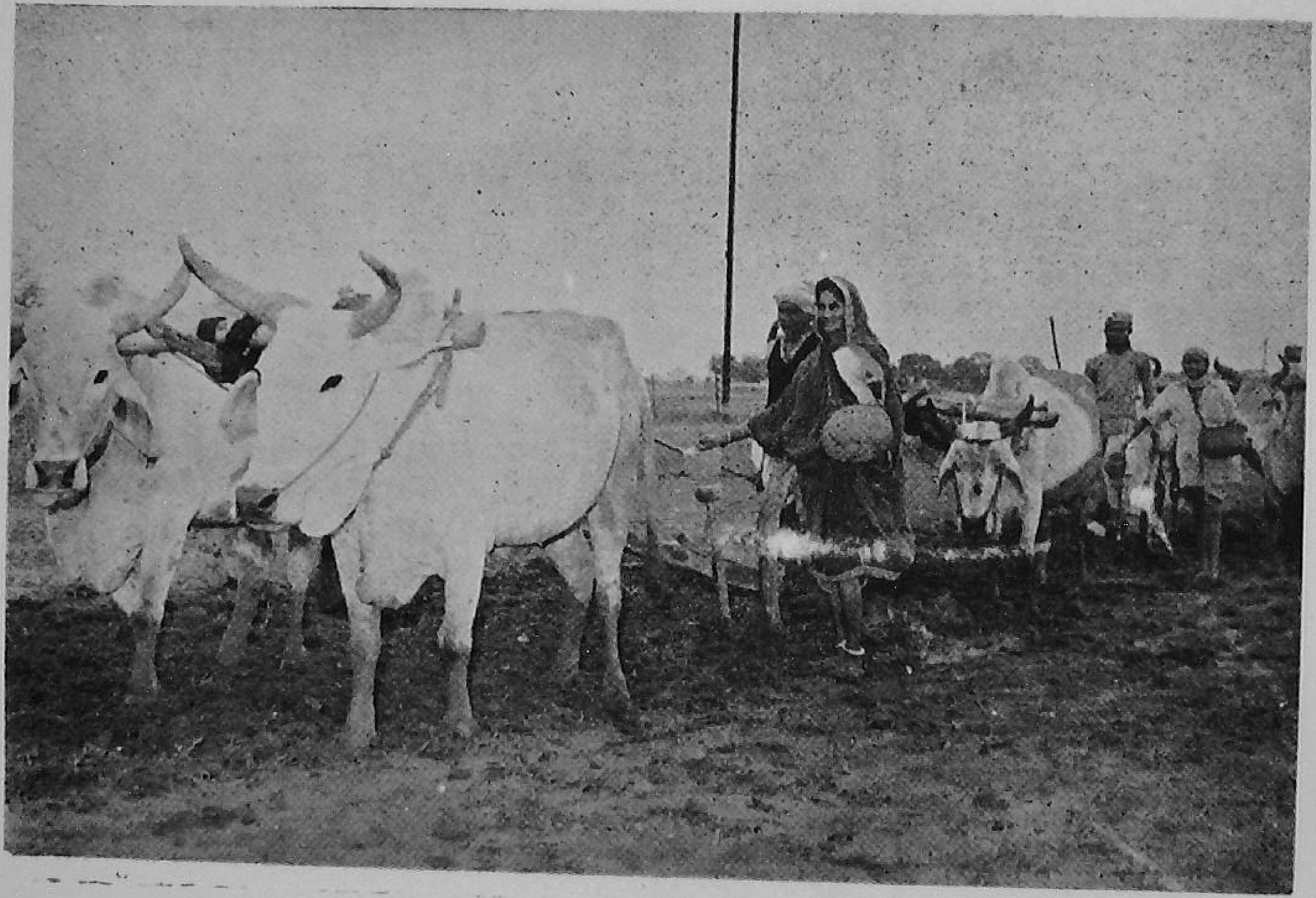
For winnowing the grains, several winnowing fans worked by rope, leather belts, chains or gears are available at a cost varying from Rs. 60 to 225. An enclosed winnower is now being manufactured in India, and such a winnower made of galvanized sheets costs Rs. 550.





Thus, from ploughing to winnowing, you can use with benefit at least a dozen improved implements, simple in design and cheap in cost. Use them and save on labour and time, and get more yields from your crop.

MORE WHEAT possible in MADHYA PRADESH



By S. P. SINGH

WITH 7.8 million acres under wheat, and producing today about 22 per cent of the total wheat produced in the country, Madhya Pradesh is trying to see how it can step up the per-acre yields.

In the State, *T. sativum* (common bread wheat) and *T. durum* (Macaroni wheat) are the two main types of wheat grown, the former occupying a larger area. The bread wheat is grown on light soils under rainfed conditions, and *durum* on heavy black cotton soils, mainly under irrigation or where the rainfall is assured.

Many years of research in the State has made improvements in wheat-growing possible. Farmers are being educated in these improved practices so that they can reap higher yields. These are briefly described here.

LAND PREPARATION

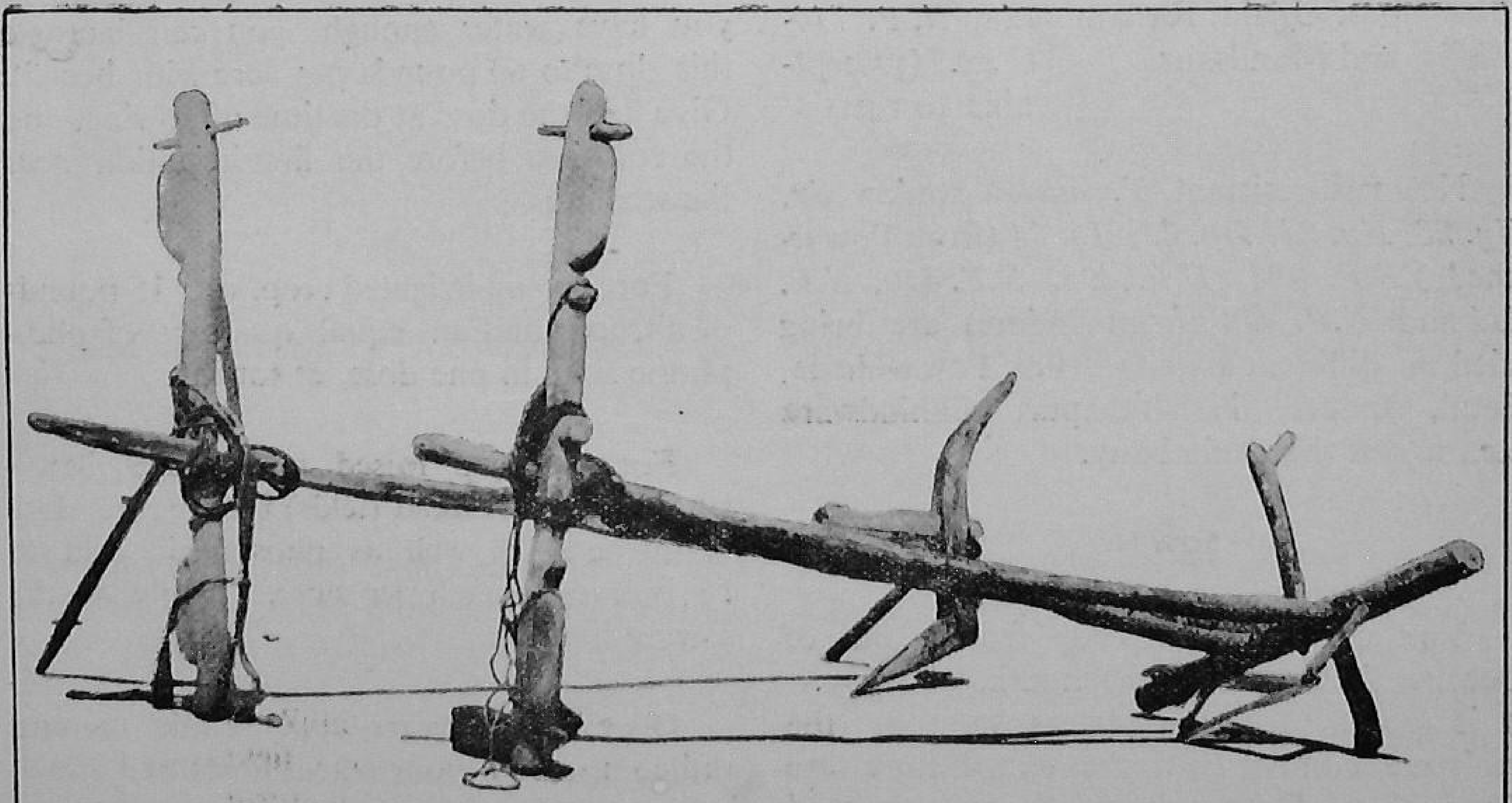
Wheat needs a fine seed-bed. You can prepare it by working the *bakhar* or *desi* plough four to six times. Better, give a heavy ploughing just before the monsoon followed by three to four *bakharings*. For a dry crop, take steps to conserve moisture during the rainy season, in addition. In the embanked fields, (the *haveli* system) you can collect rain water in the bunded field, and let it off about 15 days before the sowing time.

SEED SELECTION

Always sow a better variety. A large number of varieties suitable for the different regions and conditions in the State are available.

	Region	*Variety suitable*
(i)	All over the State	*Hy. 11*, *Hy. 65*
(ii)	For dry area	
	1. Northern districts	
	(a) Rewa, Satna, Chhatarpur, Tikamgarh and Datia	*Hy. 11*, *Hy. 38*, *Hy. 65*, *Hy. 277*, *C. 591* (susceptible to rust).
	(b) Gwalior, Shivpuri, Morena, Guna	*Hy. 11*, *Hy. 65*, *C. 281* and *N.P. 710*.
	2. *Central Madhya Pradesh*	
	(a) Bhilsa, Raisen, Sehore and Hoshangabad	*Hy. 11*, *Hy. 12*, *Hy. 25*, *Hy. 38*, *Hy. 65*, and *C. 591* (susceptible to rust)

A *desi* plough or a *bakhar* may be used for the land preparation



(b)	Embanked areas of Narsimhapur, Jabalpur, Mandla and Damoh	*Hy. 11, Hy. 25, Hy. 38, Hy. 65, Hy. 277* and *C. 591* (susceptible to rust)
(c)	Unembanked areas of the above Districts and Sagar District	*Hy. 11, Hy. 12, Hy. 38* and *Hy. 65*
(d)	Betul, Chhindwara and Seoni	*Hy. 11, Hy. 12, Hy. 65* and *Hy. 277*

3. *Paddy tracts*

Balaghat, Raipur, Durg, Bilaspur, Surguja and Raigarh	*Hy. 65*

4. *Malwa Tract*

Nimar, Dewas, Indore, Dhar, Shajapur, Ujjain, Ratlam and Mandsaur	*Hy. 11, Hy. 38, Hy. 65, N.P. 718, N.P. 710-U 22.* (susceptable to rust)

New rust-resistant *T. durum* strains viz. *Hy. 23, Hy. 24, Hy. 32, Hy. 34* (from Powarkheda) *N.P. 404, N.P. 405, N.P. 410, N.P. 411* and *N.P. 412* (from Indore) are being tried on different state-farms at Powarkheda, Betul, Indore, Narsimhapur, Chhindwara etc., to test their suitability.

SOWING

You can sow the crop from 10th of October till the end of the month. However, it is better to sow early as soon as the moisture content and the temperature are favourable. Do not forget to treat the seed with 'Agrosan GN' at the rate of 20 ounces per maund before sowing.

Use a seed-rate of 80 pounds per acre. You will need a smaller quantity, if you are drilling the seed. Sow the seed 1½ to 2 inches deep in the bunded fields and 2½ to 3 inches in open fields, adopting a spacing of 9 inches for an irrigated crop and 12 inches in between the rows for a rainfed crop.

If possible, sow only one variety in a particular field if you want to keep the seed pure. If at all you have to grow more than one variety, grow gram or *teora* on a strip of 20 feet between the different varieties.

MANURING

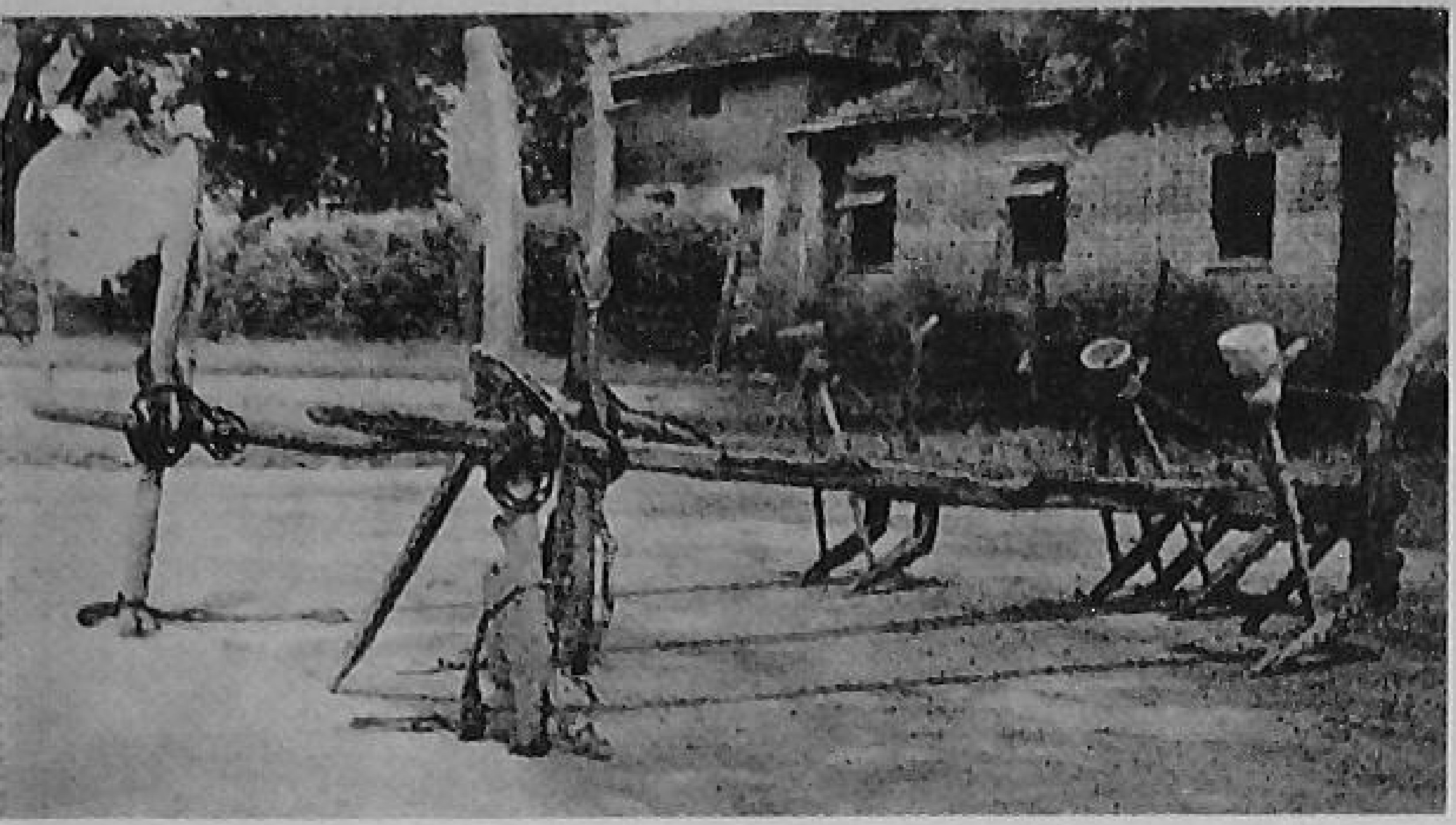
The wheat soil in the State being neutral, you can apply plenty of fertilizer to boost up the yield without any harm to the soil.

For an irrigated crop, apply 30 pounds each of nitrogen and phosphoric acid (as ammonium sulphate and superphosphate). If you have water enough, you can increase this dose to 60 pounds per acre with benefit. Give half the dose at the time of sowing, and the rest just before the first irrigation near the seedlings.

For an un-irrigated crop, use 15 pounds of nitrogen and an equal quantity of phosphoric acid, in one dose, at sowing.

For the crop raised under the *haveli* system (in embanked fields) reduce the dose of nitrogen as well as phosphoric acid to 15 pounds of each per acre. Apply at the sowing time.

Once in three years, apply cattle manure and compost to your wheat fields at 15 cartloads per acre. Green manuring is another good and cheap means of adding organic manure to the field. Irrigated wheat responds



Some improved implements recommended for sowing the seed in lines

well to green manuring. Superphosphate at 1½ maunds per acre given to the green manure crop will give a large amount of green matter. If you want to raise a green manure crop for an un-irrigated wheat, sow the seed before rains. It will be ready for ploughing under before the rains are over. Select *guar* for the areas with low rainfall and sannhemp for high rainfall areas.

IRRIGATION

The need for irrigation is more for bread wheat than for *durum* wheat.

Give the crop three to four irrigations of three to four acre-inches each. Three irrigations—one at the earlier stage, one at the root formation stage, and the third at the full bloom stage, are very important.

Avoid flood irrigation. If you do so, only about a fifth of the water you supply is actually used by the plants, and the rest goes waste. Moreover, while the low-spots in the field gets overirrigated, the higher spots get less or no water.

For a fairly level land, with a uniform slope, adopt the border strip method of irrigation.

In land having ups and downs, adopt the ditch method of irrigation.

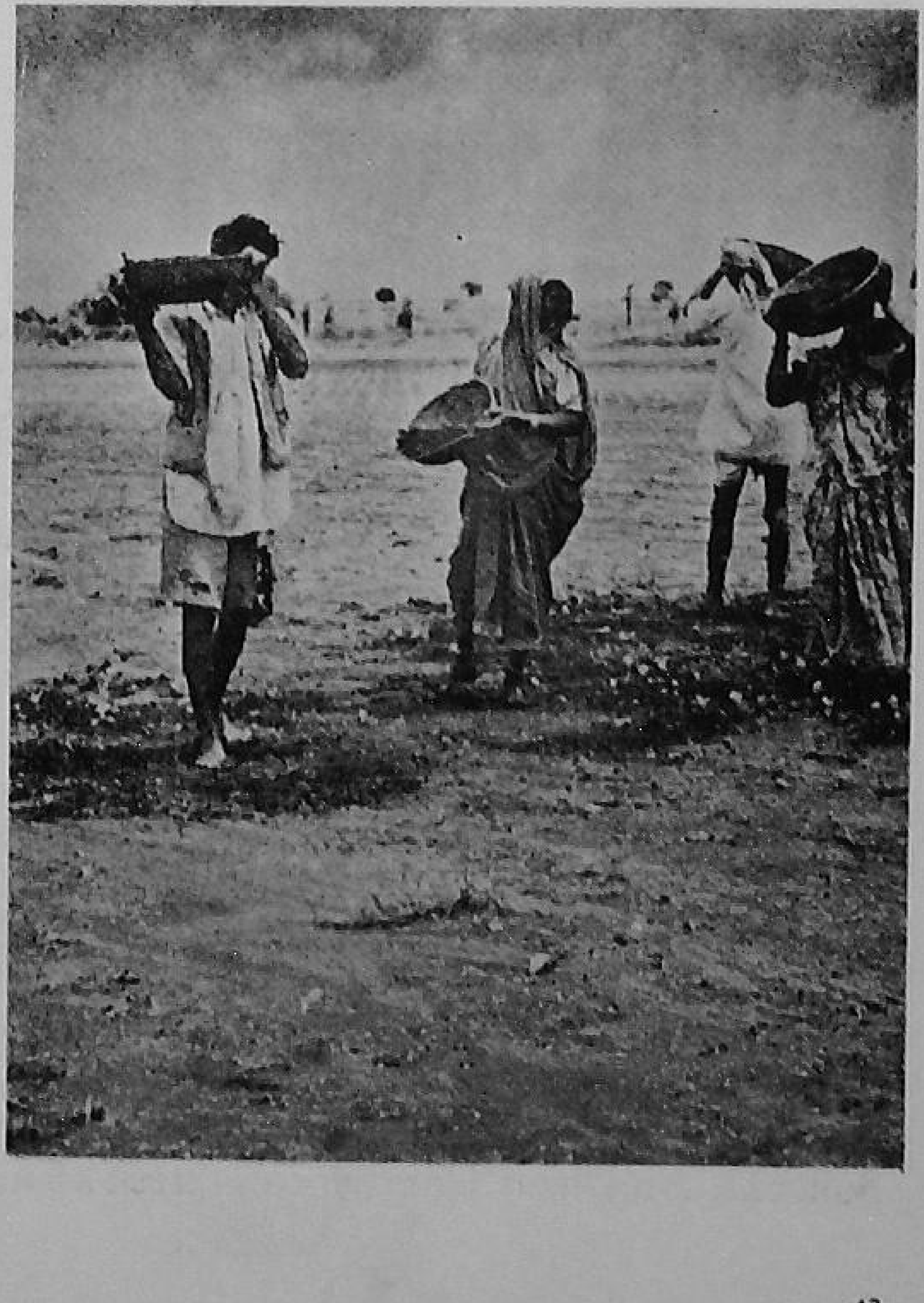
One dry hoeing after germination and weeding will suffice as intercultivation for wheat. It will conserve moisture and help the plants grow better.

DISEASES AND PESTS

Of the three rusts that attack wheat, black rust does the greatest damage. Till now brown rust was not very important in the State, but recently, it has also become serious.

Hence, always use a rust-resistant variety. Some new varieties having resistance to both black and brown rusts will soon be available.

Application of compost or farmyard manure to the fields, once in three years, is advised in the State



Another major disease is loose smut. The varieties distributed, except *C. 591*, *Hy. 38*, are fairly resistant to loose smut. If you have to use a variety which is susceptible to this disease, you can control it by the solar treatment of seed (to be taken up during the hot days of May or June before the monsoon. Soak the seed in water for 4 hours—from 8 a. m. to 12 noon on a clear day and expose it to the sun in a thin layer for thorough drying).

White ants are a problem in some parts, particularly under rainfed conditions. One or two timely irrigations, where facilities are available, would considerably check the damage. Crude oil emulsion at three to four gallons per acre, applied with irrigation water is quite effective in reducing the attack. Dusting 'Aldrin,' 'Dieldrin' or 'Chlordane' on the soil and mixing with a plough also gives good results.

In areas, where the crop is attacked by stem borer, spray wettable DDT (0.25 per cent) and burn all the stubbles.

If you have field-rat trouble, fumigate the rat burrows with 'Cyanogas' with the help of a foot-pump. But remember it should not be done near human habitations. Zinc phosphide mixed with wheat flour and groundnut oil is also used to poison the rats.

HARVESTING, THRESHING AND WINNOWING

Harvest when the crop is fully mature and the straw has turned yellow. Before harvesting, rogue out the unwanted plants. For threshing the crop, you can use a bullock-drawn Olpad Thresher instead of threshing by bullocks. An Olpad Thresher can thresh about 40 maunds of wheat grains in a day. Similarly, for winnowing you can use winnowing machines or fans for a faster job.

STORING

Clean and dry the grain well and store it preferably in concrete granaries. Spoilage in the usual storing methods has been found to be quite high.

To prevent insect damage in storage, dust the godown before storing with 10 per cent DDT (wettable powder). After storing, dust 10 per cent DDT in between the containers if you are keeping grains for seed or pyrethrum (pyrethrum 1600) for grains for consumption.

In case insect-infestation takes place, fumigate with "Chlorosal" (E.D.T.C. mixture) at 30 pounds per 1000 maunds of grain (24 hours for seed grains and 36 hours in case the grain is kept for consumption.)

In brief :

1. After the harvest of the previous crop, *bakhar* the field. Follow it by digging up the *Kans* (*Saccharum spontaneum*) and *Ber* (*Ziziphus* sp.) and heavy ploughing with an iron plough. Also, work the soil with a harrow or a *bakhar* whenever weather permits during the rainy season.
2. Apply farm compost at least once in three or four years.
3. Select rust-resistant varieties for sowing.
4. Treat the seed with 'Agrosan GN' before sowing.

5. Apply the fertilizer in two equal doses the case of the irrigated crop and in one dose with the seed during sowing for the un-irrigated crop. In no case should you keep the seed mixed with the fertilizer overnight.

6. Take a leguminous crop in rotation with wheat, at least once in three years.

7. Sow at the earliest opportunity when moisture and temperature are favourable.

8. In the case of an irrigated crop, give irrigation at early stages. You can give two to three irrigations depending on the availability of water.

9. Harvest at the right time, taking care to prevent admixtures of grains from different varieties.

10. Store the grain after drying it properly.

By adopting these practices and using a better wheat variety, Madhya Pradesh farmers can take their per-acre wheat yield high.

A good wheat crop—result of improved cultural practices

8 SURE STEPS TO MANY MAUNDS OF WHEAT

By T. C. KALA

IN RAJASTHAN, 71 maunds of wheat an acre is a big yield even if it is from the Ganganagar area, which is famous for its bumper crops. But there are steps that every farmer in Rajasthan can follow and which will result in many more maunds of wheat per acre.

1 **Sow at the right time.** Choose any time from mid-October to mid-November for sowing, depending on the local weather conditions. But never sow late. Late sowing leads to a smaller yield.

2 **Prepare your land well and keep it moist.** If you had left your land fallow during the *kharif*, plough regularly in August and September, with a plough or a *triphali*. Don't forget to run a plank.

In case your land is poor in fertility, don't leave it fallow. Grow a green manure, or a leguminous crop for green vegetables or fodder. Before raising the green manure or the leguminous crop, apply 15 to 20 seers of superphosphate to the field. This will increase the fertility of your land and cut down the cost on manure.

3 **Have a proper seed-rate.** If your's is a *peeval* (irrigated) land, sow 30 seers of seed to an acre, and if a *barani* one, sow only 25 seers.

Sow the seed in lines at a distance of 9 inches in between the rows in an irrigated land and at 12 to 15 inches in a *barani* land.

Use a seed-drill for sowing. With it, you can sow better and quicker.

4 **Grow improved varieties.** Select an improved variety for sowing. Ask your Gram Sevak or Agriculture Officer for a variety that is best suited to your area. The good varieties are:

R.S. 31-1 *R.S. 9-11* *N.P. 718*	For Jaipur and Jodhpur Divisions.
N.P. 718 *C. 591*	For Kotah and Udaipur Divisions and Ganganagar District.

5 **Treat the seed before sowing.** In June, treat the seed. Soak it in water and remove the floating earcockle galls. If loose smut is common in your area, treat the seeds quite ahead of the season, in May-June when the days are hot. Soak the seeds in water for three to four hours ; remove the seeds that float. Dry the remaining seeds completely in the sun and keep them in air-tight a container.

Before sowing, mix six tolas of 'Agrosan GN' with every maund of seed. This will prevent root rot and leaf smut diseases.

6 **Apply enough manures.** In irrigated lands, apply 15 cartloads of well-rotted compost and 3 maunds of superphosphate per acre. If you are short of compost you can apply 10 cartloads of it and 2½ maunds of ammonium sulphate or calcium ammonium nitrate instead.

Apply the compost as a basal dose while preparing the land. Place superphosphate and the nitrogenous fertilizer with the help of a seed-drill before sowing.

In unirrigated lands, apply 4 cartloads of cattle manure at the time of land preparation in September and 10 seers of nitrogen and 10 seers of phosphoric acid before sowing.

If you grow a green manure crop such as sannhemp or *guar* on your field bunds, you can get a cheap supply of a good manure. Harvest the green manure crop in August and turn it in the field.

7 **Irrigate well and in time.** How you irrigate will of course depend on the irrigation facilities you have. But here are a few tips you must not forget.

Give the first irrigation after 30 days of sowing. Before irrigating, intercultivate your field.

Seeing is believing—a farmer is seen examining the results of a demonstration

A farmer is disccussing with a Subject-matter Specialist the improved practices that lead to better yields

If yours is a sandy soil, give four to six light irrigations. But if it is a heavy soil, give only three to four irrigations, of three acre-inches.

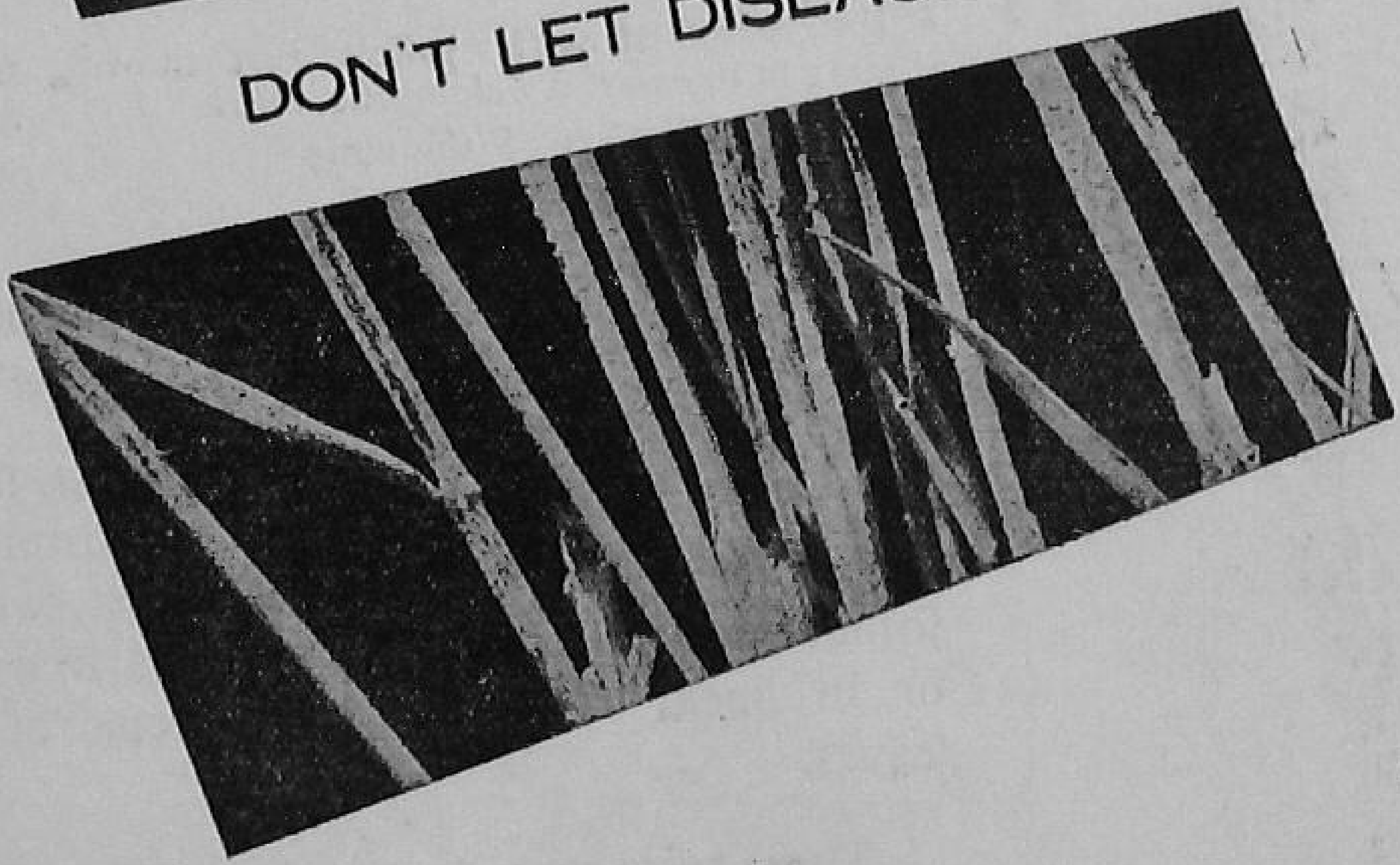
8 **Take timely action against pests.** Dust 10 per cent BHC or 2 per cent 'Aldrin' at 10 seers an acre before ploughing. This will conrol the white ants.

To destroy weeds, spray 2,4-D within two months of sowing at 10 *chhataks* mixed in 15 tins of water per acre.

These eight tips won't cost you much in time, money or labour, but they will pay you with a bumper wheat-yield.

Improved practices have rewarded farmers with a bumper wheat harvest

DON'T LET DISEASES CUT YOUR WHEAT OUTTURN



By R. PRASADA and B. L. CHONA

WHEAT diseases cause anything from some loss of crop to complete crop failures. The total loss this way to the country runs into crores of rupees a year.

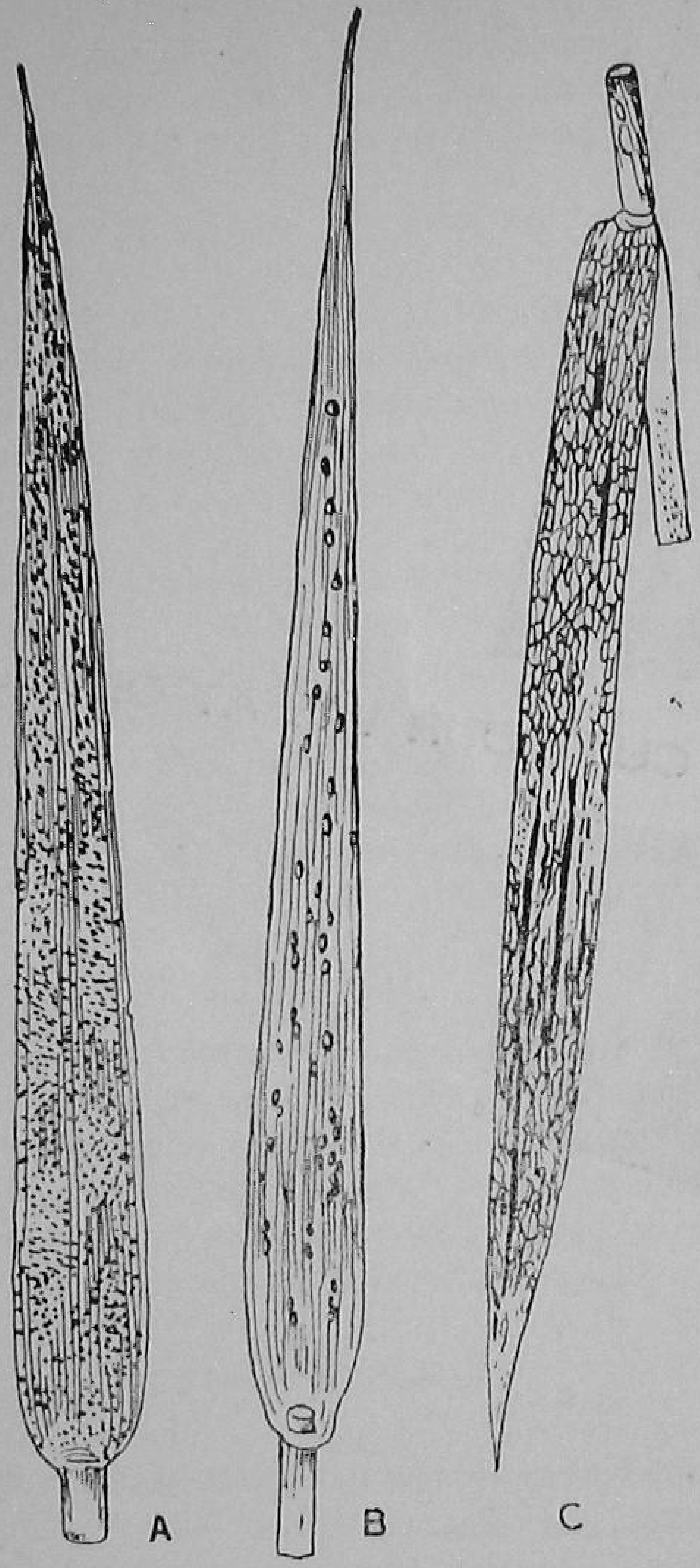
Every farmer, therefore, should know the diseases, what to do about them, and how to raise disease-free wheat crops. Here are the more important diseases that attack wheat.

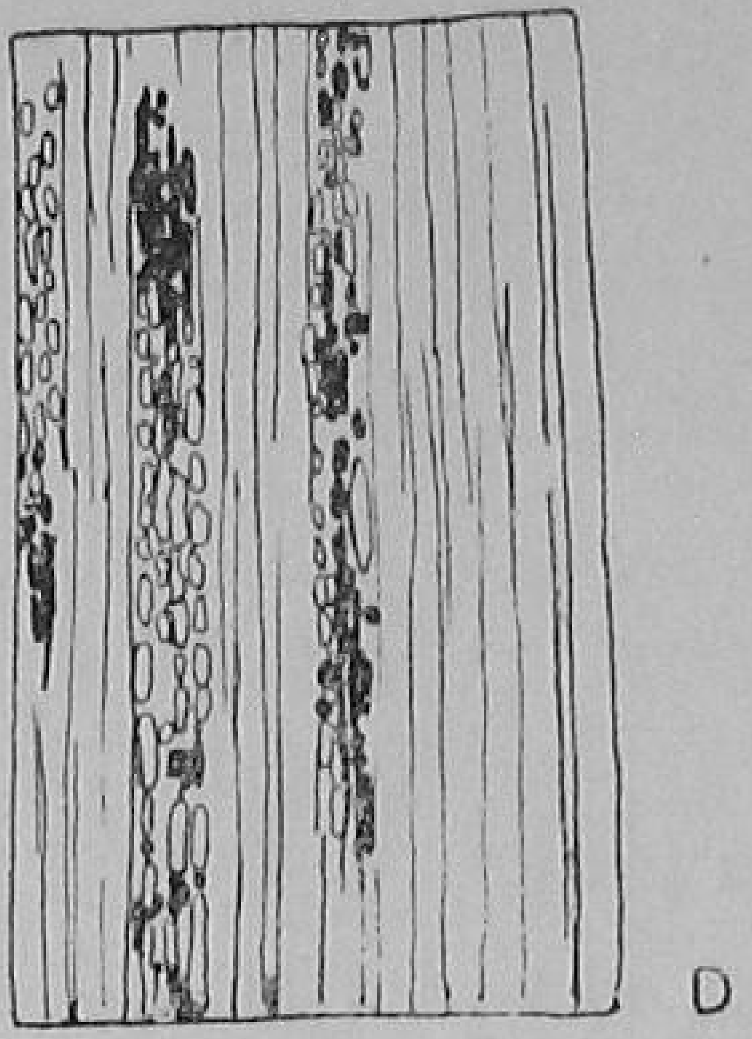
RUSTS

Rusts are the major enemies of wheat crop. This disease multiplies on wheat crop in the hills and is spread to the plains every winter.

There are three rusts that occur on wheat in our country and they are commonly known as yellow, brown and black rusts. They get their names because of the colour of the spores (minute germs) within the blisters they produce on the wheat plant. These rusts are locally known as *rali*, *ratua*, *gerua*, *tambera*, etc.

Out of the three rusts, yellow rust is the first to appear on the wheat in the plains of





A and B—Leaves attacked with orange rust, showing the blisters

C—A leaf attacked with yellow rust, showing the blisters in linear rows along the veins

D—An enlarge portion of the same

north India, followed by brown and black. In the South and Madhya Pradesh, black rust is found more, brown rust is occasional and yellow rust almost never appears except in the Nilgiris and the Palni hills.

You can make out black rust, also known as stem rust, this way. It forms big blisters on the stem, leaf and leaf-sheath of the plant, which join together subsequently and appear as open black channels later on.

Brown rust, also called orange rust, forms orange-coloured blisters separated from one another on the leaves. Yellow rust can be found out from the blisters formed in stripes or in linear rows along the veins of the leaves.

These rusts spread very fast by means of their tiny spores from plant to plant and from field to field when a dry wind blows. Rusts may break out in an epidemic form in as short a period as four to six weeks if the weather is favourable to them.

HOW TO CONTROL

The most effective and economical method of controlling all these rusts is to grow varieties of wheat which are resistant to them. Quite a number of rust-resistant wheats and several rust-tolerant varieties have been evolved in India and released for general

cultivation. These varieties have done very well in different states and given much higher yields than the local varieties. Consult your local Agriculture Officer or Gram Sevak in selecting the variety that would suit best your area. Some of the varieties are :

For the plains : *N.P. 710, N.P. 718, N.P. 792, N.P. 798, N.P. 824 and N.P. 825*

For the hills : *N.P. 770, N.P. 792, N.P. 809* and *Ridley*.

LOOSE SMUT

Loose smut is very common in the plains of north India, particularly in the Punjab and western Uttar Pradesh. It is also found frequently in the hills of north India.

Plants attacked by loose smut come into ears much earlier than the healthy plants.

Loose smut-affected wheat ears (*on the right*) show black mass of powdery spores in place of grains as in a healthy ear (*on the extreme left*)

Such diseased plants can also be found out from the earheads which contain black mass of loose powdery spores in place of grains.

Since loose smut is a seed-borne disease, better treat the seed with the solar-heat method. On a hot summer day during May-June, soak the seed thoroughly in water for four hours in the morning. Spread it out on a clean floor in thin layers in the hot sun. Let it dry till evening.

Store the treated seed in bags till required for sowing in October-November. This solar treatment is effective, cheap and simple. Any cultivator can do it without any risk. This treatment does not affect the germination of the treated seed. You can also grow smut-resistant varieties namely *N.P. 710, N.P. 718, N.P. 797, N.P. 798, N.P. 799* and *N.P. 824*.

BUNTS

Bunts get their name from the burnt look of the affected grains. The disease appears in the grains and gives a foul odour to the attacked grains with the result that the market value of the wheat flour goes down. A wheat crop affected with bunts gives a poor yield.

There are two types of bunts in the country—hill bunts, common in the hilly areas, and the partial or Karnal bunt, common in the submontane areas of the Punjab, Delhi and western Uttar Pradesh.

When the hill bunts attack, they damage as much as 40 to 50 per cent of the crop. The germs of the bunts are carried on the seed. So treat the seed with 'Agrosan GN,' 'Tritisan' or any other organo-mercurial compound.

Karnal or partial bunt, as its very name indicates, affects only a few grains in the ear

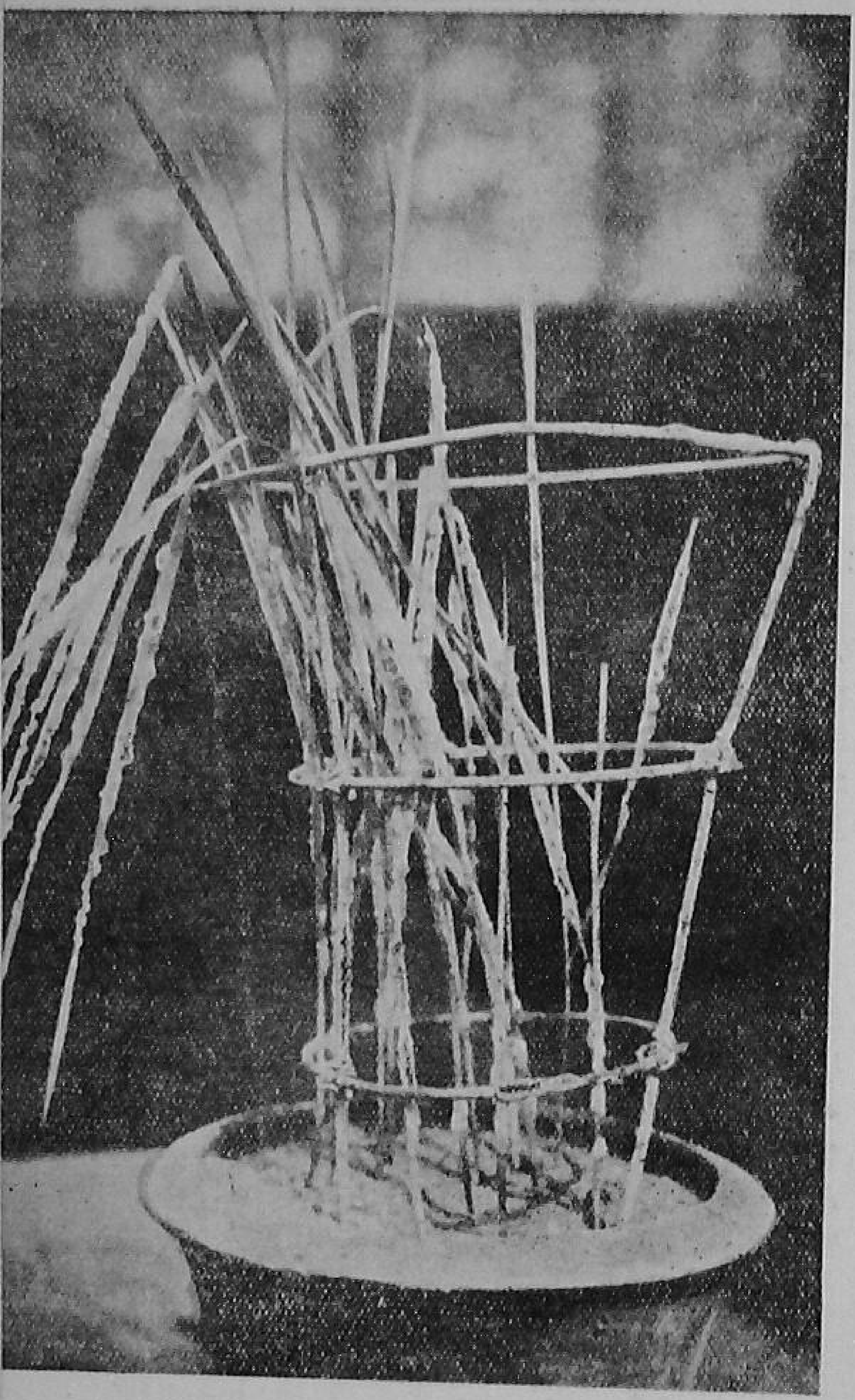
A high temperature helps in the spread of the disease. Hence, sow your wheat late, towards the end of October or early November. This will reduce the attack of the disease. Also treat the seed with 'Agrosan G N' or 'Ceresan' at 0.3 per cent.

POWDERY MILDEW

Powdery mildew is a serious disease in Uttar Pradesh and West Bengal. It is also present in the Nilgiri hills.

A high humidity and a moderately low temperature help in the spread of the disease. The lower surface of diseased leaves appears to be covered with white powder. It is made up of minute spores or the germs of the disease. They are quickly spread from plant to plant when the weather is dry.

For complete control, dust the crop with finely-powdered sulphur. Most of the new



Wheat plants affected with powdery mildew

and that too only partially. It is not so widespread. Uproot and destroy the bunt-affected plants if there are any in your field.

HELMINTHOSPORIOSE OR LEAF-STRIPE DISEASE

Due to the disease, long brown spots are produced on the leaves, leaf sheath, ear, awn, etc. In some cases of attack, the roots and the base on the stems become brown and the attacked plants die.

Wheat plants showing *Alternaria* leaf blight

N.P. varieties (700 and 800 series) are less susceptible to the disease than the older varieties (*P.4* and *P.52*). So, better grow such varieties.

ALTERNARIA LEAF BLIGHT

In Maharashtra, *durum* wheats, especially *Kenphad* varieties, are seriously attacked by *Alternaria* leaf blight.

The leaves of the infected plants show a burnt appearance. It is found that only mature leaves are attacked. The infected plants give a poor yield.

Kenphad varieties, *Niphad-4*, *Hybrid 65*, *N.P. 828*, *N.P. 829* and *Kathia* are highly susceptible, whereas *N.P. 710*, *N.P. 718*, *N.P. 798* and *N.P. 824* are resistant varieties. So grow a resistant variety suited to your area.

EARCOCKLE OR *TUNDU*

This disease is common in the Punjab, Delhi and eastern Uttar Pradesh. To control this disease, remove galls from the seed by the floatation method. Avoid growing wheat in the infected fields in successive years.

MOLYA

This is the most serious disease of wheat in the light soil regions of Rajasthan. The diseased plants are stunted, the roots are affected noticeably and there is a poor tillering. The disease in the beginning occurs in patches of varying sizes but ultimately spreads throughout the whole field.

The disease is caused by eelworms which live in soil. You can control this disease by fumigating the affected soils with D-D, though it means a good amount of cost and labour and needs special care of the land before and after the application of D-D. You can try this method when the disease is confined to a very limited area.

Earheads of wheat affected by *tundu*. On the extreme right is a healthy earhead

A good rotation of crops will help you avoid the disease. Wheat or barley taken after a one-year-fallow or after a crop of carrots, gives good yields as compared to the field where no rotation was followed. Follow this rotation for three to four years and you can get an almost *molya*-free crop.

Now that you know your wheat enemies and how to tackle them, better be on your guard and raise disease-free wheat crops.

By D. B. REDDY

PESTS THAT ATTACK WHEAT IN THE FIELD AND STORE

Pests attack the wheat crop in the field, but they are usually not so serious as those which attack wheat in the store or in the godown. Sometimes, however, the field pests also become very serious and cause heavy loss of crop.

All your labour and efforts in growing wheat may go waste if you are not careful about these pests. Hence, you should know what these wheat pests are, and take quick control measures to save your crop when they attack it.

FIELD PESTS

Termites (white ants)

If you have been growing wheat in the North, you must have seen a few dead plants here and there in the field. If you have tried to uproot such plants you must have found that they are cut at their roots or at their bases. Such a damage is caused by the termites or white ants. Termites can cause more serious damage to your wheat crop when it is grown on light soils and is not frequently irrigated.

Termites live in the soil and attack wheat plants—both young and grown-up.

How to Control

Take control measures before sowing your crop. While finally preparing the land for sowing, dust about 20 pounds of 5 per

cent BHC, or 'Chlordane', or 'Aldrin' or 'Heptachlor' and work it into the soil with a cultivator or plough. If you, however, find the termite-attack after the plants have come up, irrigate the field immediately.

Termite - mounds are often seen in the wheat field. The queen of termites lives deep down in these mounds. Remove these mounds if you find any. While removing a mound see that you have dug deep enough to remove the mound with the queen. Dust the site and the mound with 0.1 per cent 'Aldrin' (water solution) at the rate of about one litre per cubic foot volume of the mound.

Gujhia Weevil

Wheat farmers of the Punjab, Rajasthan and Uttar Pradesh suffer very often from the attack of *Gujhia* weevil on their crops. These weevils cut the seedlings when they are very young. At times the damage is so heavy that the entire field needs resowing.

Gujhia is a small weevil, about 1/4th inch long and brownish in colour. It hides under soil clods and rubbish and is active during mornings and late evenings.

How to Control

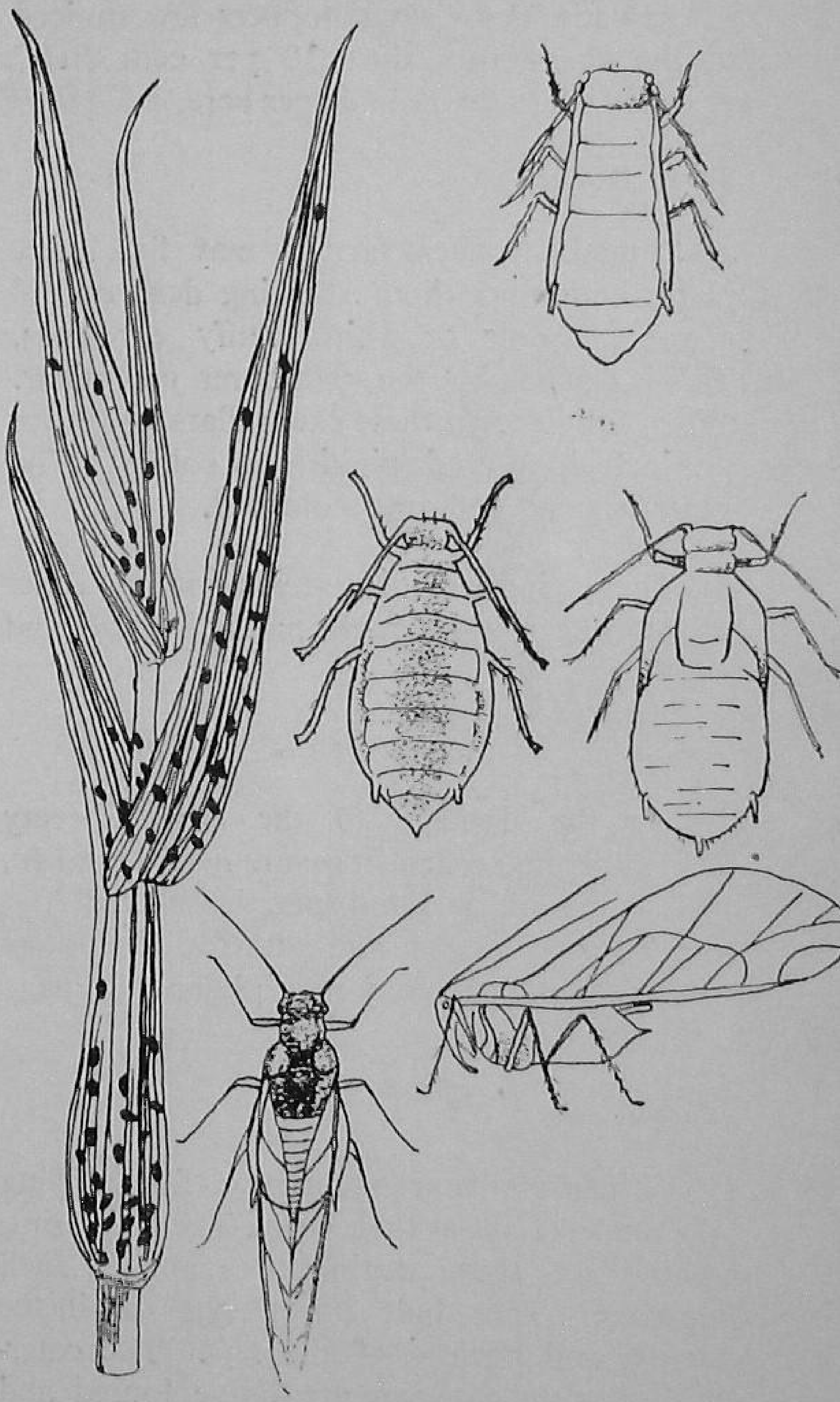
Keep a watch over the pest. As soon as you notice any in your wheat field dust the crop with 10 per cent BHC or 5 per cent 'Aldrin' at the rate of 20 to 30 pounds an acre. Rake the insecticide into soil.

Aphids

Aphids are yet another pest which our wheat farmers often find on their crops, especially when the weather is moist and cloudy. These are small, green-coloured insects found in clusters on wheat leaves, shoots and ears. They suck the juice out of the leaves and other tender parts of the plant and make them weak. The pest may cause serious damage if the attack is in the early stages of the crop, for such plants may even die. When the ear-heads are attacked, they give light and poor quality grains.

How to Control

You can control the pest by dusting 10 per cent BHC or any other such insecticide at 20 pounds an acre.



Grasshoppers

The small dull brown grasshoppers that you may find on your wheat crop can cause

considerable damage when they attack a young crop in large numbers. Both the young and the adult grasshoppers eat the tender wheat leaves. If they are not controlled in time, it may be necessary to sow the crop once again.

How to Control

As soon as the grasshoppers are noticed on the wheat crop, dust 10 per cent BHC at about 15 to 20 pounds per acre.

Stem Borer

Sometimes wheat farmers may find a few plants here and there showing dead central growing shoots or white chaffy ear-heads. This is caused by the stem borer caterpillar. When fully grown these caterpillars are about an inch long and pinkish in colour. The moth is small and grass-coloured.

These insects also attack many other crops like *jowar*, ragi, paddy, maize and sugarcane.

How to Control

As the damage to the crop is very negligible, no control measure need be taken. It is, however, a good practice to pull out the affected plants and destroy them, as otherwise the pest may multiply and damage other crops.

Cutworms

Wheat plants are sometimes found lying on the field, cut at their bases. The cutworms, which are active during the night, do such damage. They hide during the day in the cracks and crevices of the soil. The caterpillars of the cutworm are dark-coloured and are of medium size. Besides wheat, crops like gram, peas, tobacco, potato, groundnut and barley are also attacked by this pest.

How to Control

Ten per cent BHC or five per cent DDT dust will control this pest. While dusting see that the bases of the plants are dusted thoroughly.

Armyworms

Wheat growers, mostly in hill areas, find armyworms on their crop. Mediumsized, dusky coloured caterpillars of these pests eat the leaves. They, generally, are found moving in swarms from one field to another. They also attack other crops like paddy and *jowar*.

How to Control

Keep a watch over the pest and locate it early on your crop. Dust 10 per cent BHC or any such similar insecticide at 15 to 20 pounds per acre.

Rats

Rats are a great nuisance to the wheat-growers. They cut the plants—young and old. They make burrows in the fields and bunds and also damage irrigation channels.

How to Control

In order to control the rats effectively, all the farmers of the village must take control measures jointly.

In the field, bait the rats with poison. Mix three parts of zinc phosphide with 97 parts of *bajra*, crushed gram or maize. Add a little vegetable oil and make small balls. Place these poison baits in live burrows. Warfarin, Coumarin, etc., are other poisons that are used for killing rats.

As zinc phosphide is highly poisonous, handle it with care and better consult your Agricultural Officer or the Gram Sevak in the preparation of the bait and its use.

To control field rats you can also use traps with advantage.

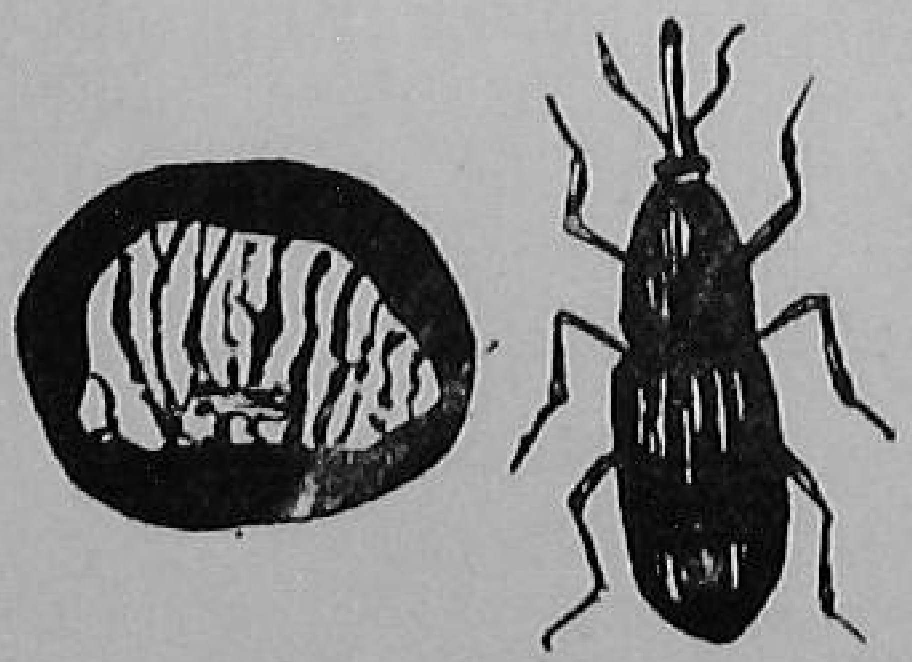
STORAGE PESTS

After keeping wheat in storage, very often, our farmers find a good amount of grain, if not all, completely spoiled.

As a matter of fact, insects, rats and moulds all attack wheat in storage and cause heavy losses to our farmers. Among these, insects are the most important pests.

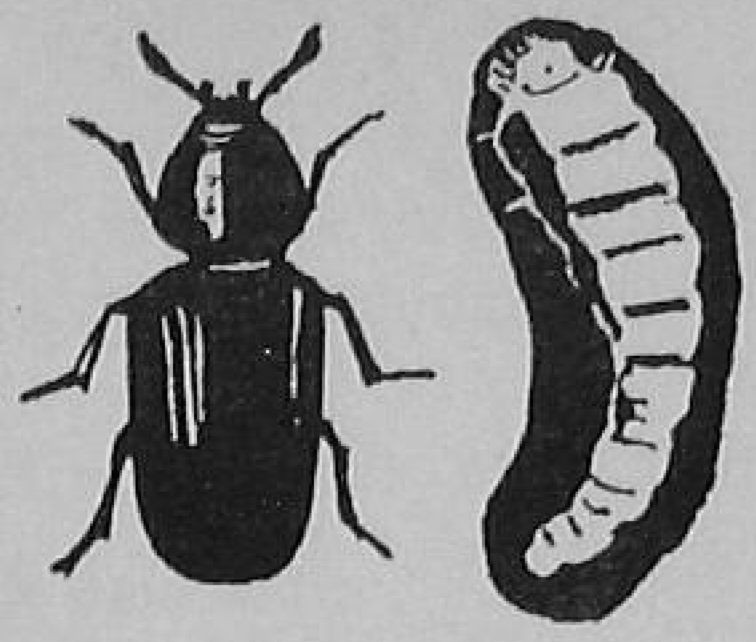
One may wonder how a newly-harvested crop is attacked by insects so soon after storing. Weevils and other storage insects live inside cracks and crevices in walls, floors, ceilings, etc. They also remain unnoticed in the storage receptacles. They can also come from the sweepings and rubbish lying near the stores. They can hide under dunnage and in the meshes and seams of bags. A new harvest can be attacked by insects from the old infested wheat either when it is mixed with the new wheat or when it is lying around. Sometimes, the new harvest can even get infested right in the threshing yard. The important storage pests of wheat are :

Rice Weevil



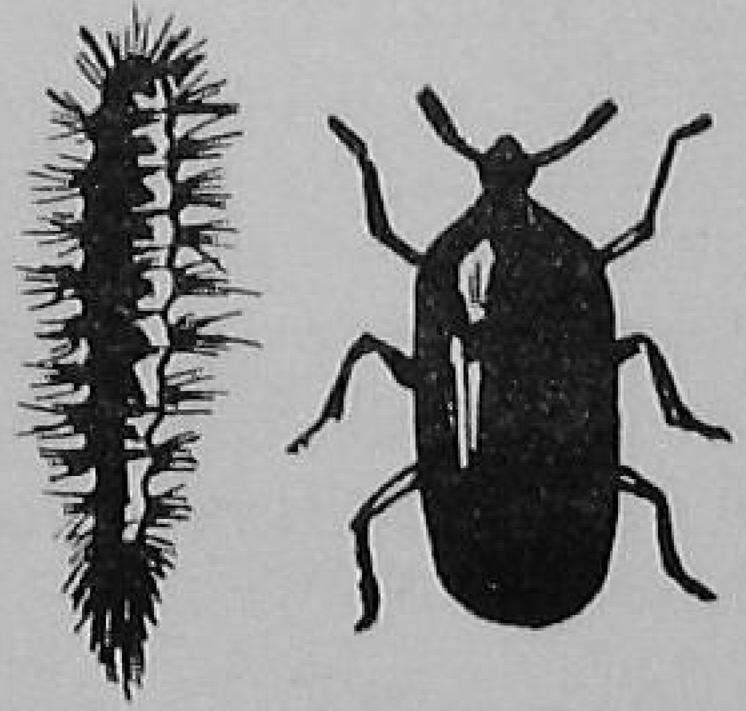
It is a small, dark brown beetle with a long snout. It has four light reddish or yellowish spots on the upper surface of its body. The adult female bores a hole in the grain with its snout. Both larva and adult cause damage to the wheat grain.

Borer Beetle



The beetle is dark brown in colour and cylindrical in shape. The head is bent. It is smaller than the rice weevil. Both adults and larvae damage wheat and other stored grains.

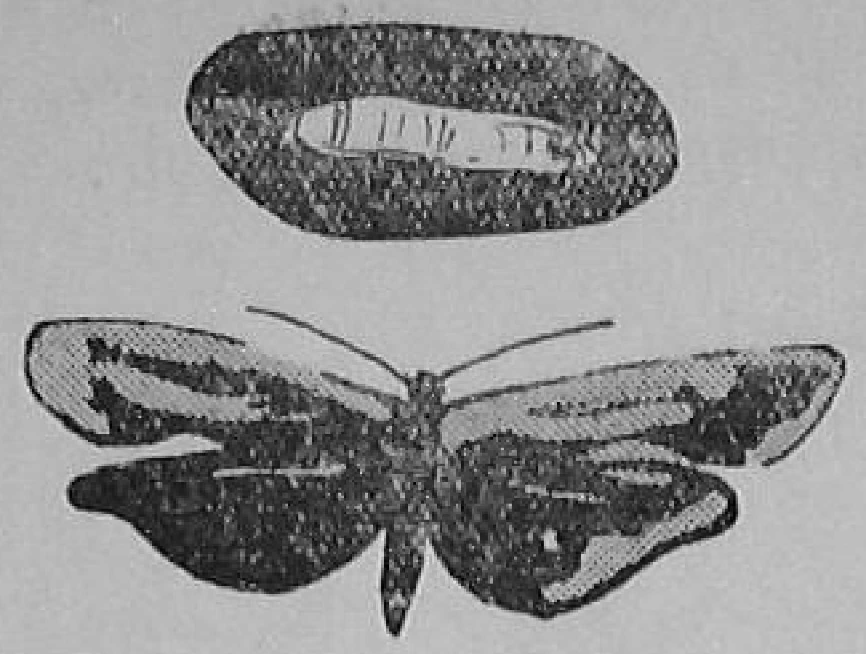
Khapra **Beetle**



It is a tiny beetle, oval in shape and with grey and light brown markings. Only the larvae eat the grain. The larvae are whitish brown and are covered with bundles of hair; a sort of a tail of hairs is also formed.

OTHER INSECT PESTS

The other insects which attack stored wheat are grain moth, rust-red flour beetle and saw-toothed grain beetle.



Grain moth

How to Control Storage Insect Pests

Remember that clean wheat should be stored in clean places. Before you store the harvested crop in earthen pots, *khattis*, *kothas* underground pits, bags, rooms or any other type of storage receptacles, see that they are thoroughly cleaned and the sources of infestation removed. Dispose the cleanings ; and the sweepings from the old stocks do not throw them near the store.

All cracks, crevices, etc., in the storage godown should be filled. Get the store white-washed. Disinfest it with insecticides like BHC or DDT (at 0.4 per cent) at 1 gallon per 100 square feet before storing wheat.

Dry wheat properly in the sun before storing it, for wheat with a moisture content higher than 10 per cent is easily attacked by insects and moulds.

Do not mix the new harvest with wheat already in storage for sometime.

Inspect frequently the stored wheat, specially during the rainy season, so that control measures can be taken in time.

Do not keep the storage receptacles in places where they are exposed to high humidity and splashes of rain. The godowns should be damp-proof, leak-proof and rodent-proof.

Place the storage receptacles or the bags on a dunnage either of seasoned wood, or bricks or stones.

Where possible the wheat should be sun-dried once or twice. This reduces infestation.

In case wheat is infested in storage, you can use E.D.C.T. mixture at the rate of 30 pounds per 1000 cubic feet of space or methyl bromide at 1 to 2 pounds per 1000 cubic feet of space.

Dust lightly the outside of the bags and the storage receptacles with 5 per cent BHC at the rate of 8 ounces per 100 square feet of area to prevent entry of insects from outside.

Do not mix insecticides with stored wheat.

Rats

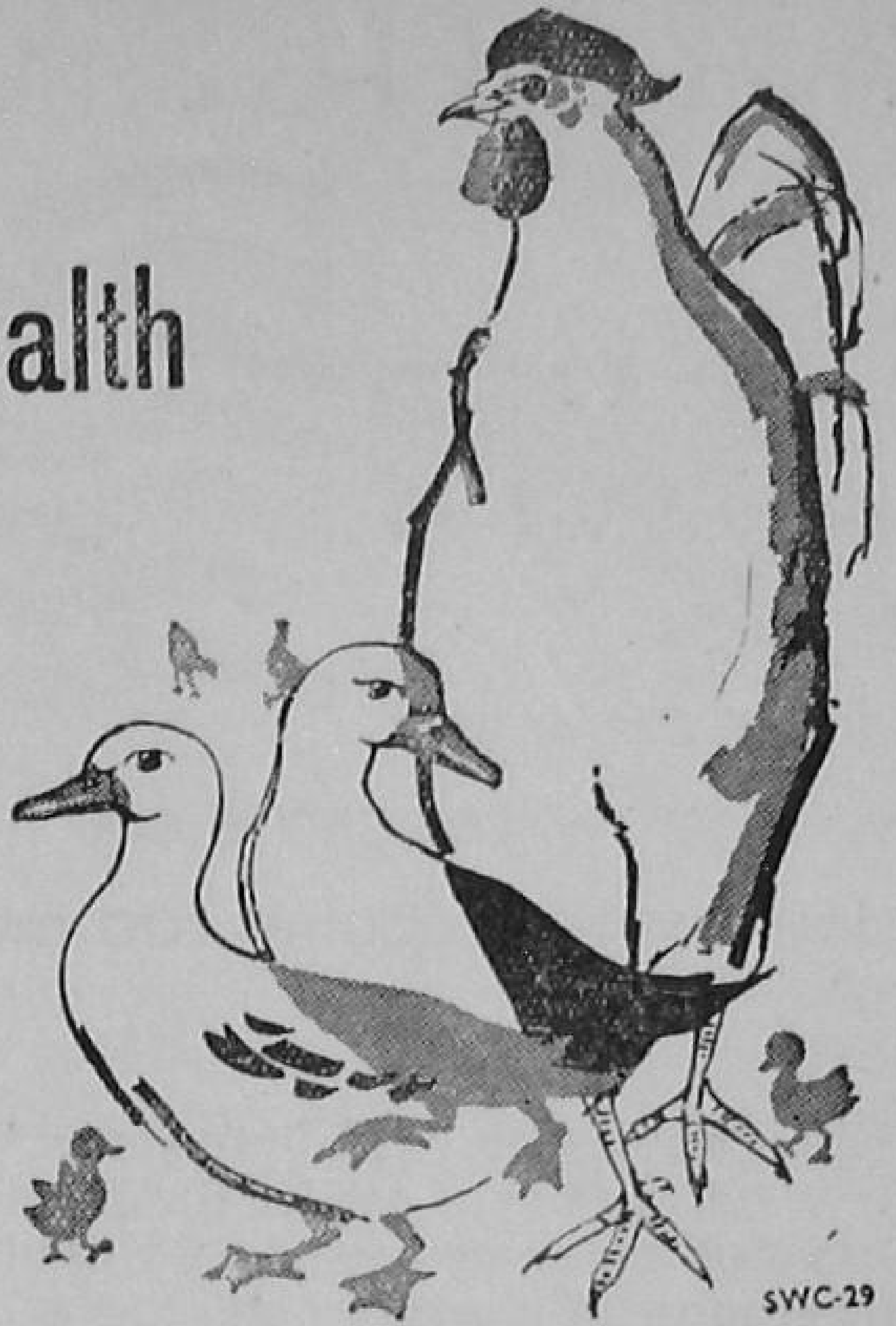
Rats cause more loss by spoilage than by actual consumption. They make burrows in *kutcha* houses and a lot of grain is stored these burrows. They are found causing loss throughout the year.

To control rats take regular measures. Use traps and poison baits but poison baiting should be done only under expert advice and by experienced persons. Under no circumstances, poison bait should be allowed to be mixed with the grain.

Moulds

Moulds cause damage by making the grain unfit for seed as well as for consumption. Stored wheat get mouldy if the grains are not thoroughly dried before storing and the godowns are damp and hot.

keep your poultry in good health



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The When and How Much of **WHEAT** IRRIGATION

By D. S. DHESI

Do you know how water helps plants grow up? Or how much water can a soil hold? Or when does water become too much or too little for a crop?

YOUR soil is a reservoir of plant foods and moisture. Water acts as a carrier for plant foods. Some of the water remains within the plants but most of it escapes into the atmosphere. How fast it evaporates depends upon many factors like temperature and humidity.

As long as there is enough water in the soil, plants keep on growing. But they start wilting and withering away if there is not enough water in the soil. Thus, there should be enough water in the soil to keep the plants always green and growing.

But the soil cannot hold water beyond a certain limit. Excess water will, therefore, go deep into the soil and thus will be lost to the crop. An excess of water will also create conditions which are not favourable to a good growth of plants.

How much water a soil a can hold depends on its texture. Coarse-textured soils contain mostly sand and can hold $\frac{1}{2}$ inch to $1\frac{1}{2}$ inches of water per one-foot depth of soil, whereas medium-textured soils which contain moderate amount of clay and a larger amount of sand can hold $1\frac{1}{2}$ to 2 inches of water.

Fine-textured soils have more of clay and less of sand. That's why these can hold $1\frac{3}{4}$ to $2\frac{1}{4}$ inches of water.

Now let us see how much and at what stage the wheat needs water so that it grows best.

SOWING

The soil to help the plants grow well needs to have good moisture in it when you sow the seed. So you must start early and see that you have conserved enough moisture during monsoon.

In case the rains have failed or there have not been good rains, give a pre-sowing irrigation.

GERMINATION

You need not give any irrigation during the germination period. In fact, even rain at this stage may harm the young plants; for, rains help form a soil crust which does not allow the young plants to come out of the soil.

Therefore, if you see any crust forming, break it with some suitable implement. And in case you find germination very poor, it is better to resow the field.

TILLERING

If you have already irrigated the field before sowing, the first irrigation given a month after sowing will be just in time for better tillering.

The crop will thus get water when it needs it most for good tillering—25 to 60 days after sowing.

VEGETATIVE GROWTH

After tillering, comes the vegetative growth. Give another irrigation during this period also.

FLOWERING

Do not give any irrigation during flowering.

GRAIN FORMATION

This is the stage when the crop needs irrigation most. See to it that the soil does not suffer from any shortage of moisture.

This in short is a guide as when to irrigate your wheat land. For exact requirements of your crop, you are the best judge. Always keep a close watch on your soil to see when it needs irrigation.

And remember that the crop requires more and more water as it goes on growing till it requires maximum irrigation during the grain-formation stage.

See that your field gets just the right quantity of water and at the right time

By R. D. VERMA

2,4-D can end weed trouble in WHEAT

THIRTY eight crores of rupees is surely a large amount. But that's exactly the amount wheat farmers in India lose every year because of weed trouble in their wheat fields which brings down the yield by as much as nine lakh tons.

Every farmer knows, weeds are a great robber, robbing the wheat crop of nutrients, water, light and other requirements so necessary for healthy growth of the crop. But how does he go about destroying this deadly enemy ? Usually by hand-weeding or

interculturing with the help of bullock-drawn implements.

Now, hand-weeding, no doubt quite effective, is a laborious, slow and costly operation. And intercultivation with bullocks, though quicker and cheaper, is definitely not very effective. For weeds, which are close to the plant and do the greatest damage, remain unharmed. And also there is every likelihood that you may damage the root system of the crop while weeding.

This is where 2,4-D comes in. This is a weedicide that offers to wheat farmers an easy, effective and economical way of destroying weeds like *bathu, piazi, hiran khuri, pitpapra, krisnanil and pohli.* And what's more, it is quite safe to use; for it is quite harmless to both human beings and animals. 2,4-D has certain other advantages also: some of these are :

- *It will cost you not more than Rs. 7* (Rs. 3 for the weedicide and Rs. 4 for the two men employed for spraying) per acre as against Rs. 16 to 20 for employing eight to ten men in hand-weeding.

- *It is easier* also to spray 2,4-D than to do hand-weeding or interculturing with a bullock-drawn implement.

- *You can do the job faster, also.* Just two men can cover an acre in a day as against eight to ten men required to hand-weed an acre.

- *You can destroy all the weeds* no matter whether they are in the crop rows or between them.

- *With 2,4-D, you destroy the weeds more effectively* and no fresh weed seeds will

The farmers are discussing happily the result of the application of 2,4-D in the wheat field. (The field in the fore ground) shows that 2,4-D has completely smothered the weeds; whereas part of the same field (at the rear) shows heavy weed growth which did not receive 2,4-D treatment

germinate afterwards. Whereas in interculturing, deeply buried weed seeds may come up to the surface and germinate.

- *With 2,4-D, you avoid the possibility of bullocks trampling over the crop* or damaging the roots of plants.

- *You can use 2,4-D any time you like* provided there is no rain within six hours after spraying.

WHEN AND HOW TO APPLY

Spray the crop between 40 and 50 days of sowing, preferably after irrigation. This is the stage when tillering is over but the tillers have not yet started growing.

Spraying 2,4-D earlier or later than this period may damage your wheat crop.

Spray one pound (acid equivalent) of sodium salt of 2,4-D. If amine or ester formulation of 2,4-D is used, the dose should be reduced to 12 ounces and 8 ounces per acre, respectively.

For exact requirements in your area, consult your Gram Sevak or Agriculture Officer.

Divide the field into long strips, 10 to 12 feet wide. For this, you can fix pegs at suitable distances on opposite sides of the field and stretch a string across the field. Very often, bunds made for irrigation can serve the purpose just as well.

Prepare the spray this way. Put the required quantity of weedicide in a container. Add a little water and mix it well so that there are no lumps. To this mixture, add as many tumblers of water as there are strips to be sprayed.

Take out a tumbler of this mixture and add it to a bucketful of water. Spray it uniformly over a strip. This way cover all the strips. You will find that 50 to 60 gallons of water will suffice for an acre.

See to it that you do not spray the same area twice, for it may damage the crop.

TAKE THE FOLLOWING PRECAUTIONS

1. Do not spray 2,4-D on a wheat crop which is sown mixed with some 2,4-D sensitive crop (broad-leaved) like gram, oilseeds and linseed.

Narrow leaved crops like rice, wheat, oats, barley, maize, *jowar*, *bajra*, ragi and sugarcane are not affected by 2,4-D, when sprayed with a proper dose and at proper stages of growth.

2. See that drift from spray does not fall on sensitive crops in the adjoining fields. For this:

(a) Spray on a calm day when there is no breeze.

(b) Use a thick spray and lower the spray nozzle to about a foot above the ground if there is a sensitive crop within ten feet.

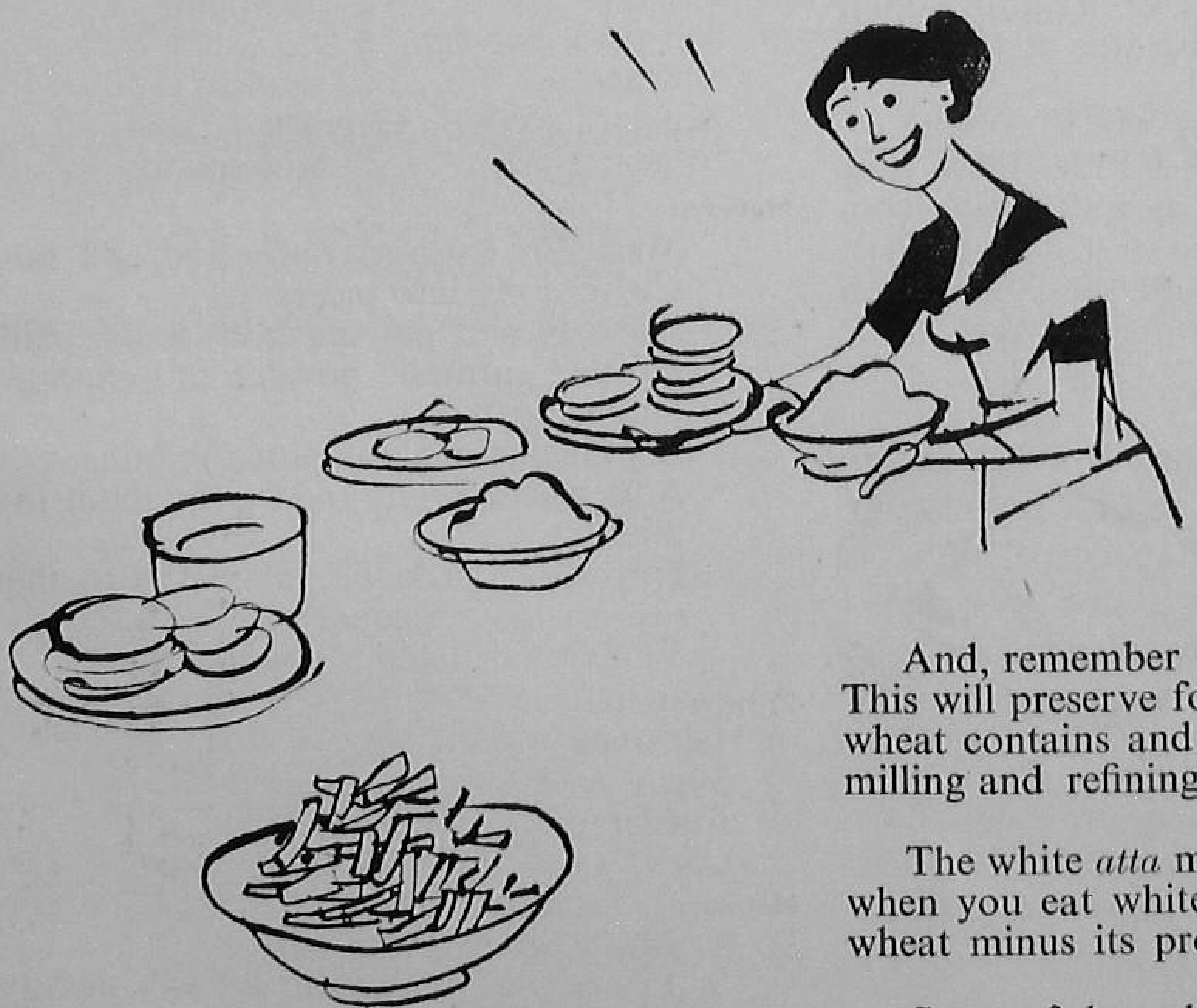
(c) Use a cloth screen between the crop being sprayed and the sensitive crop. A *dhoti* can serve the purpose well. But wash it after spraying. Get also the clothes worn by workers washed at the end of the operation.

It takes about 10 to 14 days for the weeds to die. It may even take more time if the temperature is very low.

The first sign of 2,4-D effect is the curling and twisting of the growing points of plants, within two to three days of spraying. If you find these signs, you can be sure that 2,4-D has been effective.

Try 2,4-D, in your wheat field and you will agree that it is the best weed-killer.

GIVE YOURSELF A TREAT WITH WHEAT



DON'T be satisfied with just making *chapaties* from wheat day after day.

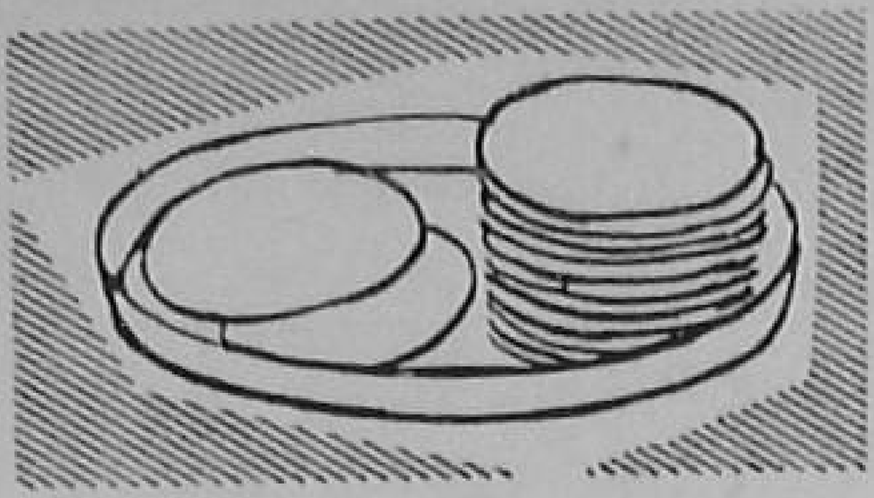
There are other tasty dishes you can prepare from wheat. Easily prepared, they will add to the variety, and also be nourishing for the family.

And, remember to use whole wheat *atta*. This will preserve for you all the food values wheat contains and which is removed in the milling and refining of the grain.

The white *atta* may look good to you, but when you eat white *atta*, you will be eating wheat minus its protein.

Some of these dishes, as you will see, you can prepare with whole wheat grain or its flour. Hence, the dishes are richer in food value.

BISCUIT ROTI



Ingredients :

Wheat flour	2 ounces
Ginger	¼ *chhatack*
Green chillies	20
Curry leaves	10
Besan to mix	
Salt to taste	
Ghee or oil for frying	
Freshly-grated half coconut	

Method :

Knead wheat flour to make a dough (as in *puries*).
Chop ginger, chillies and curry leaves very finely.
Mix the grated coconut and salt, and bind it together with *besan* (grain flour).
Make small balls with this mixture and keep aside.
Make small balls of wheat dough.
Roll the wheat ball a little. Place it in centre, and cover it up with dough from the sides (just as for stuffed *chapatti*).
Now roll out the stuffed *puri* and deep fry in *ghee* or oil.

HALWA

Ingredients :

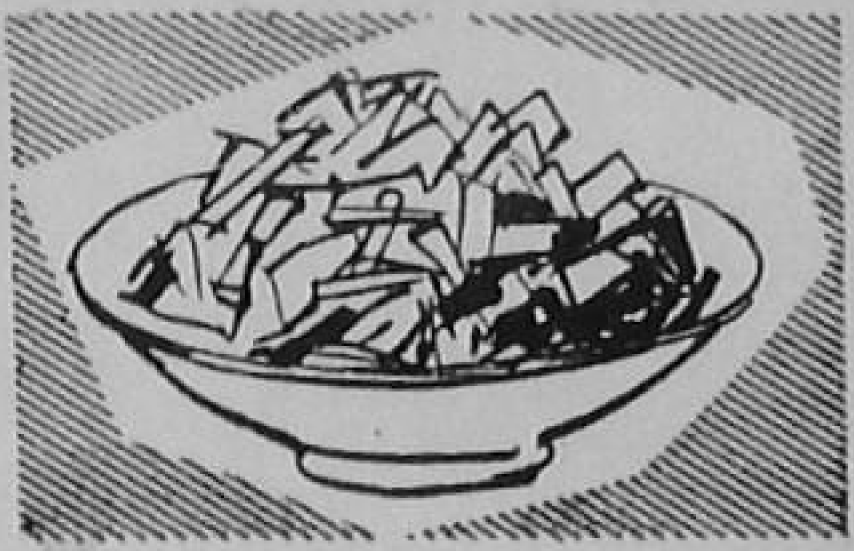
Atta	3 ounces
Gram	1 ounce
Milk	4 ounces
Jaggery	2 ounces
Water	2 pounds

Method :

Clean, pick and wash gram.
Soak it for two hours.
Remove the husk and grind it.
Roast *atta* in an aluminium vessel.
Add the ground gram to 1½ pounds of water and stir it for some time.
Melt the jaggery with half a pound of water, strain it and add it to the above mixture by stirring.
When the mixture becomes thick, remove it from the fire and add hot milk.

Note: Instead of jaggery and milk, you can also use salt and curd.

CHURMA FROM LEFT-OVER ROTIS



You can prepare it in three ways : *namkin* (saltish), sweet, and in milk.

1) Ingredients :

Left-over *rotis*	8 medium size
Salt to taste	
Chilli powder	½ teaspoon
Turmeric powder	¼ ,,
Onions	4 small
Mustard seeds	a pinch
Mustard oil	2 tablespoons

Method :

Mash the left-over *roties* and add salt.
Cut onions into pieces.
Heat oil and put mustard seeds, chilli powder, turmeric powder and chopped onions.
Fry them for about three minutes.
Add mashed *rotis* and fry for about five minutes.
Sprinkle a little bit of water so that *churma* may become soft.
You can also add coriander leaves.

2) Ingredients :

Left-over *rotis*	8
Sugar or jaggery	¼ seer
Cardamons	4
Ghee	2 tablespoons

Method :

1. Mash the left-over *rotis*.
2. Fry *churma* in *ghee* till it turns slightly brown.
3. Add sugar and fry for a while.
4. Peel and grind the cardamom and add it in *churma*; take it off from the fire.

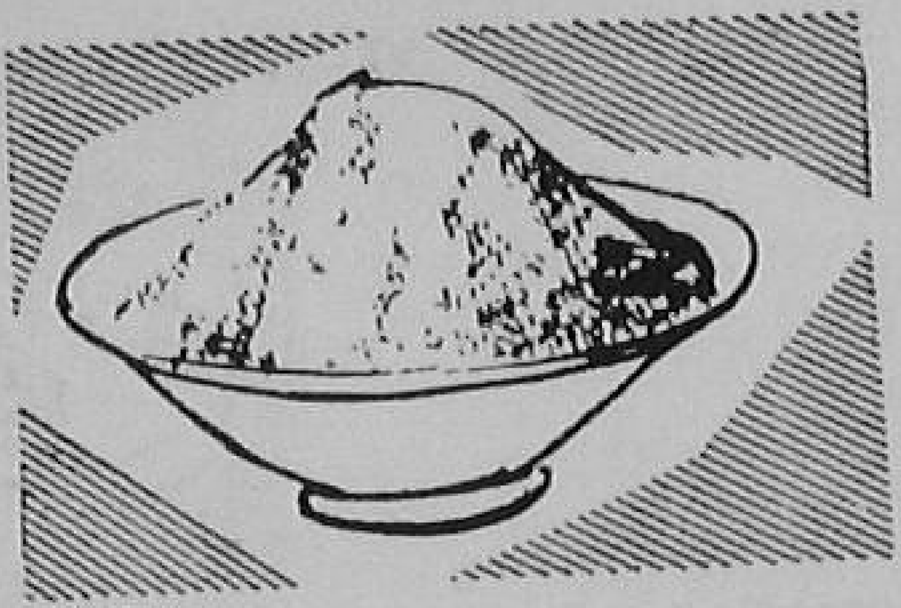
3) Ingredients :

Left-over *rotis*	8
Milk	$\frac{1}{4}$ seer
Sugar	$\frac{1}{4}$ seer
Cardamoms	4

Method :

1. Mash the left-over *rotis*.
2. Add milk, sugar and ground cardamoms.

WHEAT HOTCH-POTCH



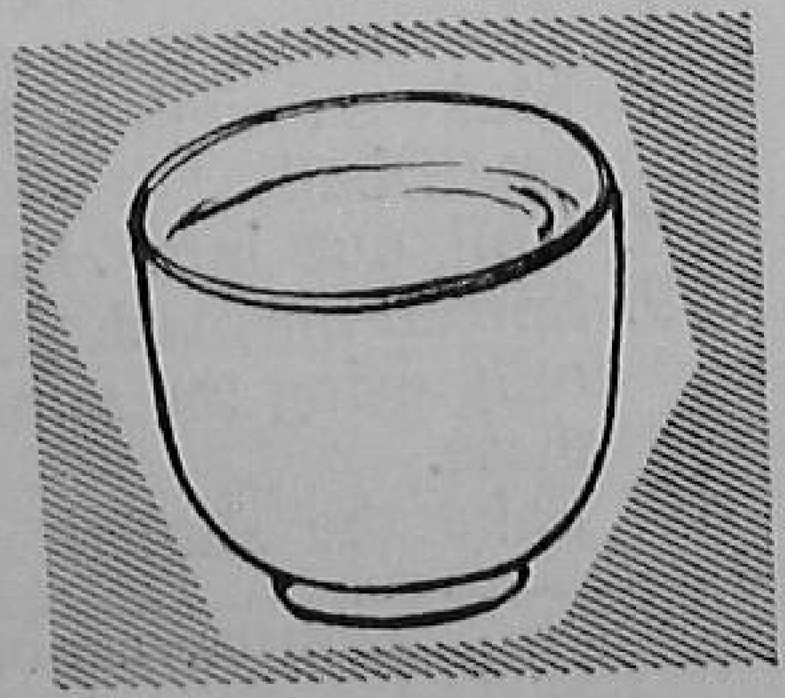
Ingredients :

Cracked wheat	4 tablespoons
Water	8 tablespoons
Green chillies	2
Ginger	a small piece
Coriander	$\frac{1}{2}$ teaspoon
Salt	1 teaspoon
Potato	1 small
Oil	1 tablespoon

Method :

1. Grind the green spices and roast in oil.
2. Wash, peel and dice potatoes in small cubes; add to roasted spices and stir.
3. After two minutes, add wheat and stir.
4. Add water and let the mixture cook for 20 minutes on a slow fire. Serve hot.

WHEAT PORRIDGE



Ingredients :

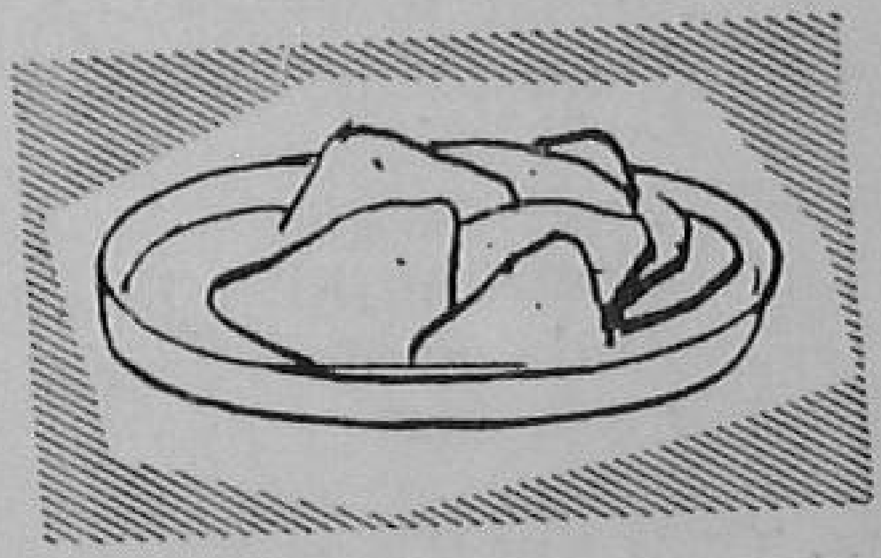
Cracked wheat	2 ounces
Sugar	2 ounces
Fat	1 teaspoon
Water	12 ounces

Method :

1. Roast wheat in a teaspoon of hot fat in a pan. Remove the roasted wheat from the pan.
2. Warm about 12 ounces of water in the same pan. Add roasted wheat to it and keep stirring for a while.
3. Let it cook. Cover the pan with a lid, and stir at short intervals.
4. When it is quite thick, add sugar. Let it stand on fire for another five minutes.
5. Remove the pan from the fire and serve hot.

It will take only 15 minutes to prepare the porridge.

CRACKED WHEAT PATTIES



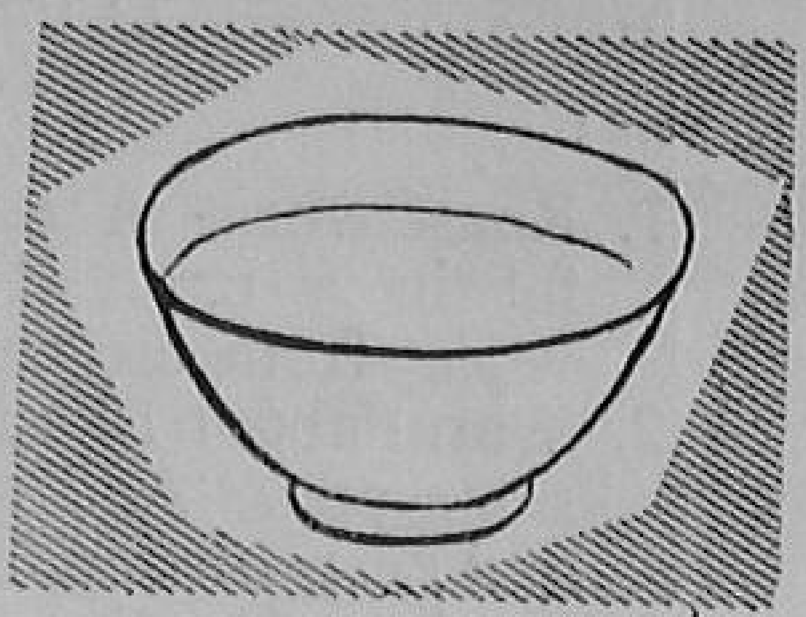
Ingredients :

Cracked wheat	2 tablespoons
Green chillies	2
Coconut	$\frac{1}{2}$ tablespoon
Salt	1 tablespoon
Turmeric	$\frac{1}{4}$ tablespoon
Potatoes	$\frac{1}{2}$ pound
Oil	$\frac{1}{4}$ pound
Ginger	a small piece

Method :

Roast wheat in one teaspoon of fat.
Add water and spices to the roasted wheat and cook on a slow fire for 20 minutes.
Remove from fire.
Boil, peel and mash potatoes.
Add salt to the mashed potatoes.
Take a small ball of mashed potatoes at a time, make into a cup, and fill it up with the wheat mixture.
Cover with mashed potatoes and flatten.
Fry in fat using shallow frying method until golden brown.
Serve hot.

WHEAT AND RAGI PORRIDGE



Ingredients :

Wheat (whole)	2/3 cup
Ragi (whole)	1/2 cup
Milk	1 cup
Gur	to taste
Cardamom (small)	1 or 2

Method :

Pick, clean, wash and steep wheat and ragi grains separately in water overnight.

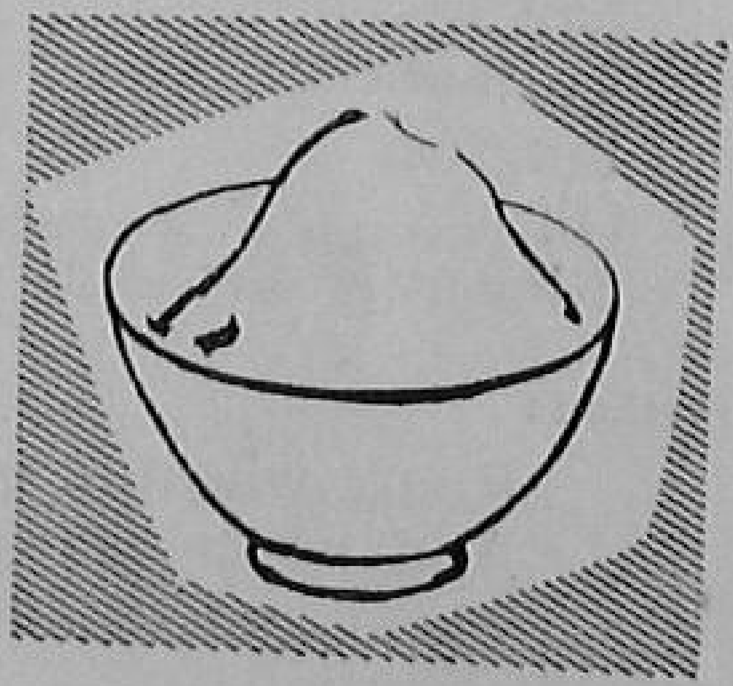
In the morning, grind them and then mix them together.

Add milk and about three cups of water to the mixture and cook on a slow fire till it is well cooked.

Add crushed cardamoms and *gur*. Cook for a few more minutes.

Serve hot for breakfast. This is a nourishing dish for children and can be easily digested.

WHEAT AND RAGI HALWA



Ingredients :

Wheat (Whole)	2/3 cup
Ragi (Whole)	1/3 cup
Milk	1 cup
Ghee	1 tablespoon
Gur	to taste
Cardamom (small)	1 or 2

Method :

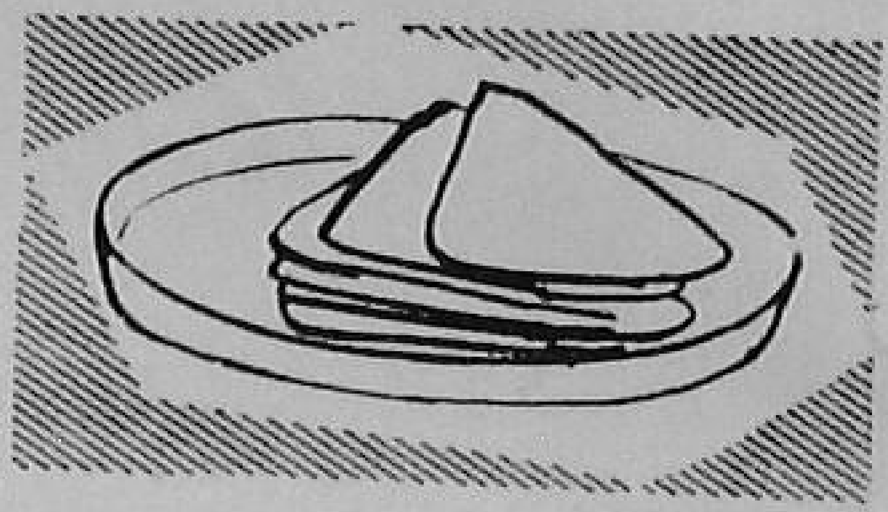
Clean, pick, wash and steep wheat and ragi grains separately in water overnight.

In the morning strain the water and grind the soaked grains to a fine paste. Heat *ghee* in a *karahi*. Add the ground wheat and ragi and fry on a slow fire till light pink in colour.

Add milk, *gur* and opened out cardamoms.

Continue cooking on a slow fire, stirring all the time, till the milk has dried up. Serve hot; or set on a metal plate greased with an edible oil. Cut into pieces when set. Serve with breakfast or tea.

STUFFED CHAPATI



Ingredients

Atta	1 ounce
Ragi flour	1 ounce
Salt	1/8 teaspoon
Water	
Any green vegetable like spinach	4 ounces
Oil	1 teaspoon
Onion	3/4 ounce

Method :

1. Wash the *saag* (spinaeh) but do not cut before cooking.
2. Peel and cut the onions into small pieces.
3. Fry them in oil till they are golden brown.
4. Add $\frac{1}{4}$ cup of water and salt.
5. When the water is boiling, cook the *saag* in it for 10 minutes.
6. Then mash the *saag*.
7. Make a dough with *atta* and form four small balls.
8. Roll out into *chapatis*.
9. Spread the mashed *saag* on two *chapatis* only using the remaining two to cover these.
10. Bake the stuffed *roti* on a *tawa*.

ACKNOWLEDGEMENT

I wish to thank Mrs. I. Attavar and Mrs. L. Rao for their contribution towards the recipes given in this article.

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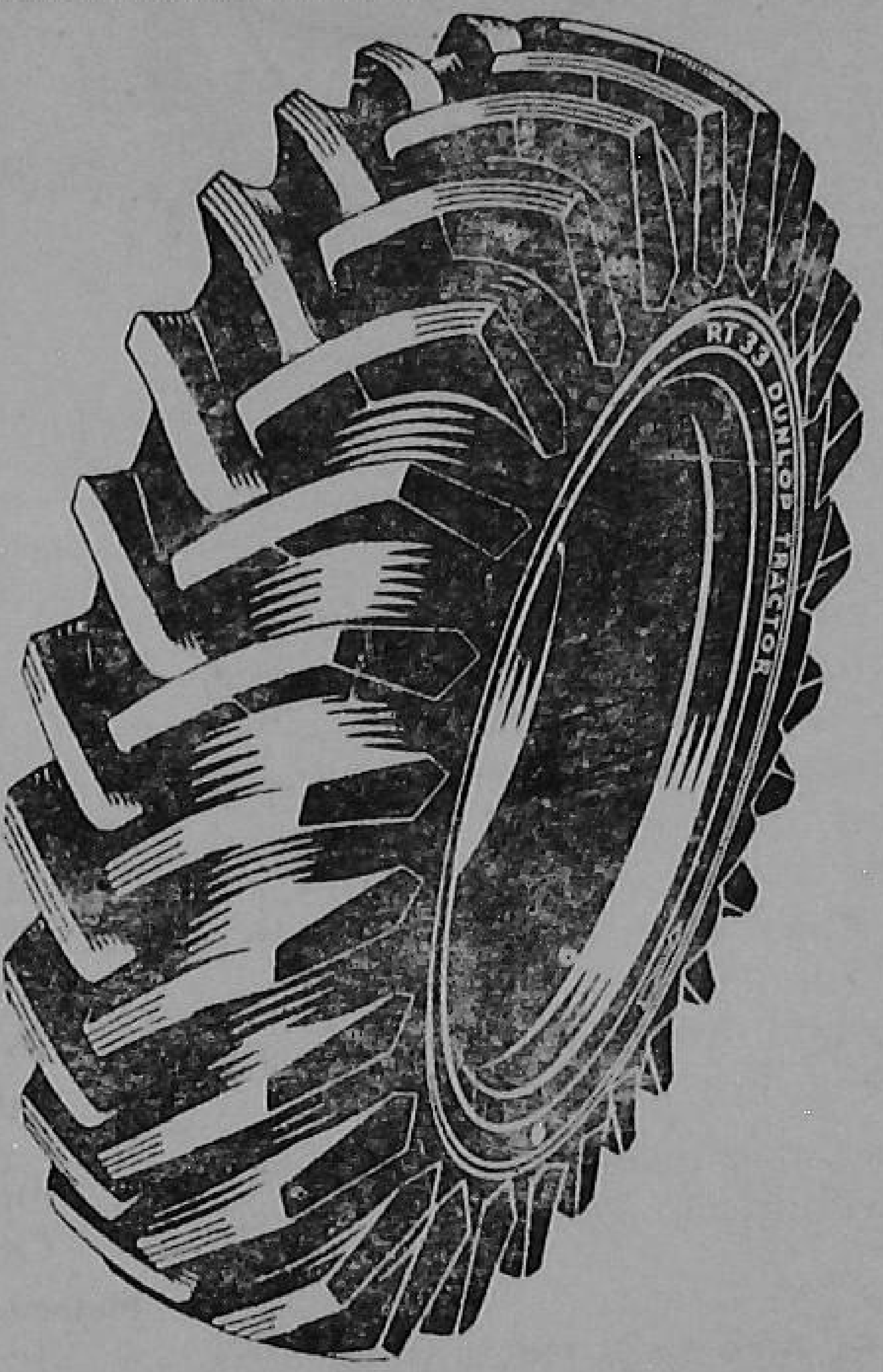

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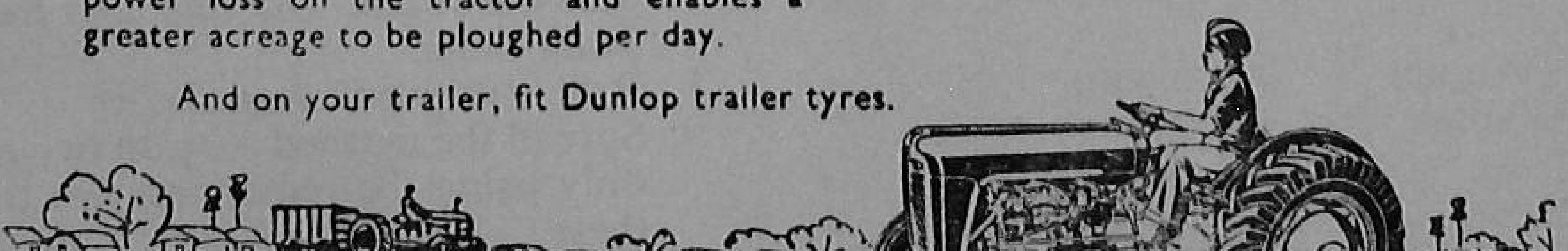

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